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UNIVERSITY OF PENNSYLVANIA RADIOCARBON DATES VI

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INTRODUCTION

In conformance with the request of the editors, ages in this date list have been calculated with the Libby half life value of 5568 ± 30 yr, although the present best estimate of the half life value is 5730 ± 40 yr (Godwin, 1962). Additional support for the latter value as being closer to the "effective" value for dating has been obtained by the measurements of samples of known age.

Our standard samples for calibration are 110-yr old oak samples. These, when corrected for age, have C^{14} contents equal to 95% of the NBS oxalic-acid standard. The differing fractionation effects as reported by Craig (1961) in the processing of oxalic acid have negligible bearing on our age calculations since we have continued to use the wood standard. Our measurements of C^{13}/C^{12} ratios of different lots of CO_2 obtained from the NBS oxalic acid demonstrate also that significant and variable fractionation effects occur in the "wet" conversion of oxalic to CO_2. The minor variations of our wood samples due to fractionation effects are being determined presently by the measurement of C^{13}/C^{12} ratios.

All samples have been pretreated with HCl and some, where noted in the date list, have received additional NaOH pretreatment for the removal of possible humic acid contaminants. All samples were counted at least twice.

The B.P. ages are calculated from A.D. 1950, and the errors quoted include the half life error of ± 30 yr. These samples were measured in 1961 and 1962.

SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. Eastern United States

P-426. **>41,000**

Ivory tusk from N margin of Spy Pond (42° 24′ N Lat, 71° 09′ W Long), a glacial kettle, Arlington, Mass. The tusk, identified as that of a probiscidian mammal by N. D. Harris, Mus. of Science, Boston, Mass., was found on the sandy bottom of the pond under 3 ft of water. Coll. 1960 by Arvid Carlson, Arlington, Mass.; subm. by Harris. *Comment*: sample was taken from a well-preserved central portion of the tusk, and washed only with water (no HCl). The age quoted is the two-sigma limit of detection, based upon three counts of 1000 min each. The apparent age of the tusk was 42,060 ± 4305 yr B.P.

II. ARCHAEOLOGIC SAMPLES

NEAR EAST

A. Syria

Ras Shamra series, Syria

Ras Shamra (35° 37′ N Lat, 35° 48′ E Long), lies on the E shore of the

Mediterranean Sea, 9 mi N of Latakia (Lattaquia) in N Syria. The site, the ancient Phoenician capital of the region, has yielded materials ranging from Neolithic through the Bronze Age. Subm. by C. F. A. Schaeffer, Collège de France, Paris. Samples P-460, 459, 458, 457, 389 represent stratigraphic series from 14 m (Pre-pottery Neolithic) to 4 m (Ubaid). (Schaeffer, 1961a, 1961b).

P-460. Pre-pottery Neolithic, 13.75 m to 14 m — **8364 ± 101 / 6414 B.C.**

Charcoal and earth from pt. 132, 13.75 m to 14 m, on virgin soil in West Baal Temple sounding. Coll. 1956.

P-459. Pre-pottery Neolithic, 13 m — **8142 ± 100 / 6192 B.C.**

Charcoal and clay from pt. 128, 13 m, in West Baal Temple Sounding. Coll. 1960.

P-458. Neolithic, 11.15 m — **7686 ± 112 / 5736 B.C.**

Charcoal and clay from pt. 118, 11.15 m, West Baal Temple sounding. Coll. 1960.

P-457. Neolithic, 9 m — **7184 ± 84 / 5234 B.C.**

Charcoal and clay from pt. 102, 9 m, West Baal Temple sounding. Coll. 1960. *Comment*: NaOH pretreatment.

P-389. Early Ubaid Period, 4 m — **6134 ± 173 / 4184 B.C.**

Charcoal and gravel from pt. 175, 4 m, from burned material at bottom of Ubaid level, overlying Tell Halaf level. Coll. 1954.

P-462. Late Bronze Age 3, Little Palace — **3140 ± 151 / 1190 B.C.**

Charcoal and clay from Dromos Tomb I in the Little Palace, Late Bronze Age 3. Coll. 1958. *Comment*: NaOH pretreatment.

P-384. Late Bronze Age, Royal Palace, No. 1 — **3079 ± 64 / 1129 B.C.**

Charcoal from burned wooden beam from wall of Royal Palace, Late Bronze Age. Coll. 1954.

P-461. Late Bronze Age, Royal Palace, No. 51 — **2991 ± 53 / 1041 B.C.**

Charcoal from burned wooden beam from main wall of Royal Palace, Late Bronze Age. Coll. 1951.

B. Jordan

Tell es-Sultan series, Jericho, Jordan

These samples represent a succession of pre-pottery Neolithic levels at Tell es-Sultan, Jericho (31° 53′ N Lat, 35° 27′ E Long), Jordan. The sites here represented (D, E, and F) were excavated by the British School of Archaeol. at Jerusalem under K. M. Kenyon, Director. The phases indicated are building sequences within the sites, those of Site D have been correlated

with Site F, while those of E have not. Coll. and subm. by Kenyon (1954 a, b, 1955, 1956 a, b, 1957 a, b, 1959; Zeuner, 1954).

P-379. Pre-Pottery Neolithic A, Site D **9655 ± 84**
7705 B.C.

Charcoal from phase YY-XX succeeding Stage VI of pre-pottery Neolithic A defenses of Site D-I. Coll. 1958. *Comment*: half of the sample (P-379) received standard HCl pretreatment, while the other half (P-379A) received additional NaOH pretreatment; difference in ages was not significant, and the average of four counting runs is quoted here. Compare with British Museum date for material from same phase of Site D: BM-106, 10,300 ± 200; and from phase BB-CC, final destruction of pre-pottery Neolithic A defenses: BM-110, 10,180 ± 200 (British Museum IV).

P-380. First Pre-Pottery Neolithic B, Site D **8610 ± 75**
6660 B.C.

Charcoal and ash from first pre-pottery Neolithic B level, Phase EEii, of Site D-I. Coll. 1956.

P-376. Mesolithic, Site E **11,166 ± 107**
9216 B.C.

Charcoal and ash and/or gravel from Mesolithic level, Phase YY, of Site E-I, II, V. Coll. 1958. *Comment*: NaOH pretreatment.

P-377. First Pre-Pottery Neolithic A, Site E **9582 ± 89**
7632 B.C.

Charcoal and ash and/or gravel from first pre-pottery Neolithic A level, Phase RR, of Site E-I, II, V. Coll. 1958.

P-381. Early Pre-Pottery Neolithic B, Site E **8658 ± 101**
6708 B.C.

Charcoal and ash from early pre-pottery Neolithic B level, Phase N, of Site E-I, II, V. Coll. 1955. *Comment*: NaOH pretreatment.

P-382. Mid-Pre-Pottery Neolithic B, Site E **8956 ± 103**
7006 B.C.

Charcoal and ash from mid-pre-pottery Neolithic B level, Phase KKii of Site E-I, II, IV. Coll. 1954. *Comment*: NaOH pretreatment. Note that, although stratigraphically later than P-381, P-382 yielded a date significantly earlier (298 ± 144 yr = 2.1 sigma). Compare British Museum date for material from same phase of Site E as P-382: BM-115, 9170 ± 200 (British Museum IV).

P-378. Pre-Pottery Neolithic A, Site F **9775 ± 110**
7825 B.C.

Charcoal from phase SSii succeeding construction on pre-pottery Neolithic A defenses of Site F-I. Coll. 1958. *Comment*: compare with British Museum date for material from same phase of Site F-I: BM-105, 10,250 ± 200 (British Museum IV).

C. Iraq

Grai Resh series, Iraq

Grai Resh (36° 25′ N Lat, 42° 10′ E Long), is a N Uruk site, comparable to Gawra XIA-VIIIB, on the S slope of the Sinjar Mts. in NW Iraq. The road

from Tell Afar to Balad Sinjar cuts through the mound site, exposing a dark stratum underlying ashy strata.

P-469. Grai Resh, South Face **5169 ± 64**
3219 B.C.

Charcoal and ash from exposed S face of road cut. Sample was taken from ends of 20 cm band of dark material 2.5 m below surface. *Comment*: exposed 3 cm of surface material was removed before sampling. Quantities of unidentified larvae were removed from the soil at time of sampling.

P-468. Grai Resh, North Face **4939 ± 75**
2989 B.C.

Charcoal and ash from exposed N face of road cut. Sample was taken from midpoint of 20 cm band of dark material, under maximum height of the mound, 3.2 m below surface. *Comment*: large quantities of fine roots noted in the sample, all visible ones removed before pretreatment.

Nimrud series, Iraq

Nimrud (36° 20′ N Lat, 43° 10′ E Long), also known as Calah, lies S of Mosul on the E bank of the Tigris River in Iraq. The city was founded as the capitol of Assyria under Assur-nasir-pal II (reigning from 883 to 859 B.C.), and was neglected after 727 B.C. Nothing is known of Nimrud after the fall of neighboring Ninevah in 612 B.C. Coll. 1952 by H. Helbaek; subm. by F. R. Matson.

P-464. Southeast Building, Room IV **2690 ± 62**
740 B.C.

Charcoal from charred beam in Room IV of the Southeast Building, destroyed by heavy fire. *Comment* (F.R.M.): NaOH pretreatment. Surface material was scraped from the charred beams of P-463 and P-464 before sampling in an effort to avoid surface contamination, but may have introduced post-sample growth error.

P-463. Southeast Building, Room II **2643 ± 63**
693 B.C.

Charcoal from charred beam in Room II of the Southeast Building, destroyed by heavy fire. *Comment*: NaOH pretreatment.

P-530. Nippur, Uruk Protoliterate "b" **4672 ± 74**
2722 B.C.

Unidentified wood charcoal from the fire pit of Level XVII, Inanna Temple area of Nippur (32° 07′ N Lat, 45° 10′ E Long), Iraq. Coll. 1961 and subm. by R. C. Haines, Oriental Inst., Univ. of Chicago, Chicago, Ill.

D. Iran

Hasanlu Tepe series, Iran

Hasanlu (37° N Lat, 45° 28′ E Long), is located near the town of Nagadeh in Azerbaijan province of Iran, about halfway between Nagadeh and the S shore of Lake Urmia, just S of the small freshwater lake known as Hasanligut or Shor Gol. Coll. and subm. by R. H. Dyson, Jr., director of the Joint Expedition of the Univ. Mus., Univ. of Pennsylvania, the Metropolitan Mus. of

Art of New York City, and the Archaeol. Service of Iran. Four cultural phases, all overlying the Painted Orange Ware Phase (Period VII) of carinated bowls and plain grit-tempered pottery, are represented by the samples from the Citadel Mound listed below. The Button Base Phase (Period V) is characterized by small gray-ware cups with loop handles and disc bases, and by disc-based simple painted buff-ware vases; the material is known elsewhere in the late second millennium B.C. The more recent Gray Ware Phase (Period IV), represented by spouted pitchers, was ended by the sacking of the site, an event perhaps fitting historically with a known Urartian campaign in the area at the end of the 9th century B.C. The following Triangle Ware Phase (Period III) is thought to date to the end of the Median period, late 7th century, B.C. The beginning of the uppermost phase repreesnted by these samples is the Post-Triangle Ware Phase (Dyson, 1958, 1959, 1960a, b, 1962; Pennsylvania III).

Button Base Phase (Period V)

P-418. Operation XVI, B **2899 ± 49**
949 B.C.

Charred wood from Operation XVI, Stratum 5, Area 1, under wall A, Sample B. Coll. 1959. *Comment*: half of the sample (P-418A) received standard HCl pretreatment, while the other half (P-418B) received additional NaOH pretreatment; difference in ages was not significant, and the average of four counting runs is quoted here. Estimated date: 1200 to 1000 B.C.

P-419. Operation XVI, A **2880 ± 45**
930 B.C.

Charred wood from Operation XVI, Stratum 5, Area 1, under Wall A. Sample A. Coll. 1959. *Comment*: half of sample (P-419A) received standard HCl pretreatment, while other half (P-419B) received additional NaOH pretreatment; difference in ages was not significant, and the average of five counting runs is quoted here. Estimated date: 1200 to 1000 B.C.

General comment on Button Base-Phase samples: compare with other samples from the Button Base at Hasanlu: P-185, 3000 ± 120, and P-198, 3083 ± 122 (Pennsylvania III). P-198 is from a grave which belongs typologically to the succeeding Gray Ware Phase, but is one of the earlier burials of that phase and may mark a tentative division between the two phases.

Gray Ware Phase (Period IV)

P-421. Operation XLI, Burned Building II **2913 ± 56**
963 B.C.

Charred wood from large beam lying on the floor of NW storage room, Burned Building II, Operation XLI, Stratum 3, Area 3. Coll. 1959. *Comment*: half of sample (P-421A, 2550 ± 62) received standard HCl pretreatment, while the other half (P-421B, 2913 ± 56) received additional NaOH pretreatment; the difference in ages (363 ± 83 yr = 4.4 sigma) was significant, and the age of P-421B is quoted here.

P-423. Operation XLIV, Burned Building I **2896 ± 51**
946 B.C.

Charred wood, beam fragments from door in E wall of main room in E

wing of Burned Building I, Operation XLIV, Stratum 3, Area 8. Coll. 1959. *Comment*: half of the sample (P-423A) received standard HCl pretreatment, while the other half (P-423B) received additional NaOH pretreatment; difference in ages was not significant, and the average of four counting runs is quoted here.

P-425. Operation XXV, Burned Building I **2872 ± 62**
922 B.C.

Large lumps of charcoal, fragments of structural timber found in debris of Burned Building I, Operation XXV, Stratum 2, Area 3. Coll. 1958. *Comment*: half of sample (P-425A, 2719 ± 54) received standard HCl pretreatment, while other half (P-425B, 2872 ± 62) received additional NaOH pretreatment; difference in ages (153 ± 82 yr = 1.9 sigma) was significant, and the age of P-425B is quoted here.

P-323. Operation XXII, Burned Building I **2858 ± 45**
908 B.C.

Large lumps of charcoal from burned post in E column of S wall of main columned hall of wall of main columned hall of Burned Building I, Operation XXII, Stratum 3, Area 2, Coll. 1958. *Comment*: half of sample (P-323A) received standard HCl pretreatment, while the other half (P-323B) received additional NaOH pretreatment; the difference in ages was not significant, and the average of six counting runs is quoted here.

P-440. Operation XL, Burned Building II **2864 ± 64**
914 B.C.

Charcoal and charred wood, covered with red dust, from large wooden beam fallen on bench in kitchen next to stairway. Operation XL, Stratum 4, Area 2. Coll. 1960. *Comment*: NaOH pretreatment.

P-322. Operation IX-G, Burned Level Under Tower 4 **2857 ± 54**
907 B.C.

Charcoal and gravel from Oper. IX-G, Stratum 4, running under Triangle Ware Phase reconstruction of main citadel fortification at NW corner of Tower 4. Coll. 1958. *Comment*: half of sample (P-322A, 2708 ± 58) received standard HCl pretreatment, while the other half (P-322B, 2857 ± 54) received additional NaOH pretreatment; the difference in ages (149 ± 79 yr = 1.9 sigma) was significant, and the age of P-322B is quoted here.

P-437. Operation XXXVII, Burned Building II Columned Hall **2841 ± 63**
891 B.C.

Large pieces of charcoal from the hall of Burned Building II, Operation XXXVII, Stratum 5, Area 5. Coll. 1960. *Comment*: half of sample (P-437A) received standard HCl pretreatment, while the other half (P-437B) received additional NaOH pretreatment; difference in ages was not significant, and the average of two counting runs is quoted here.

P-424. Operation XXIV, Burned Building I **2816 ± 55**
866 B.C.

Charcoal fragments from structural timber found in debris of Burned Building I, Operation XXIV, Stratum 3, Area 1. Coll. 1958. *Comment*: half of

sample (P-424A) received standard HCl pretreatment; while other half (P-424B) received additional NaOH treatment; difference in ages was not significant, and average of three counting runs is quoted here.

P-439. Operation XXV, Burned Building I, Area 1 — **2811 ± 64 / 861 B.C.**

Charcoal and sand from Burned Building I, Operation XXV, Stratum 3, Area 1. Coll. 1958.

P-577. Operation R-24, Burned Building III — **2779 ± 69 / 829 B.C.**

Dried grapes from Operation R-24, Stratum 3, Area 2, inside Container 8. Coll. 1962. *Comment*: NaOH pretreatment.

P-250. Operation XXV, Burned Building I, Area 2 — **2740 ± 79 / 790 B.C.**

Charred wood from roof beam found in debris of Burned Building I, Operation XXV, Stratum 3, Area 2. Coll. 1958.

P-576. Operation R-23, Burned Building III — **2681 ± 69 / 731 B.C.**

Charred wheat grain from Operation R-23, Stratum 3, Floor 3. Coll. 1962. *Comment*: NaOH pretreatment. Sample damp.

General comment on Gray Ware-Phase samples: of the samples listed above, P-576 and P-577 are representative of the final occupation of this phase—wheat and grapes harvested shortly before the sacking of the site. The other samples listed are from structural timbers representative of the construction of the phase. Therefore, the complete listing of the ages of all these samples does not prove to be statistically consistent, but samples representing the construction of the phase are consistent, as are the samples representative of the final occupation:

	Average
Construction samples (NaOH pretreatment; P-322, 323, 421, 424, 425, 437, 440)	2865 ± 20
Final occupation (NaOH pretreatment; P-576, 577)	2730 ± 49
Difference	135 ± 53 ($= 2.5\sigma$)

The difference is clearly significant and would indicate, first, that the samples bracket the Gray Ware Phase and second, that the phase was short-lived. Compare with other samples from the Gray Ware Phase at Hasanlu: P-198, 3083 ± 122; P-186, 2881 ± 119; P-111, 2770 ± 130; and P-187, 2765 ± 117 (Pennsylvania III).

Triangle Ware Phase (Period III)

P-399. Operation XXX-A, Wall D Pavement — **2521 ± 54 / 571 B.C.**

Large lumps of charcoal and fine ash from burned material overlying

pavement associated with Wall D, West Gate area. Coll. 1960. *Comment*: half of sample (P-399A, 2390 ± 62) received standard HCl pretreatment, while other half (P-399C, 2521 ± 54) received additional NaOH pretreatment; difference in ages was significant (131 ± 82 yr = 1.6 sigma), and age of P-399C is quoted here.

P-398. Operation XXXIV, Grain Storage Pit **2473 ± 54 / 523 B.C.**

Charred wheat from a grain storage pit dug into the Gray Ware-Phase ruins of Burned Building II, Operation XXXIV, Stratum 5a, Area 2. Coll. 1960. *Comment*: half of sample (P-398A) received standard HCl pretreatment, while other half (P-398B) received additional NaOH pretreatment; difference in ages was not significant, and the average of three counting runs is quoted here.

P-420. Operation VII, North Trench **2347 ± 54 / 397 B.C.**

Grain from Operation VII, Stratum 3, North Trench, over pavement of Triangle Ware Phase. Coll. 1959. *Comment*: half of sample (P-420A) received standard HCl pretreatment, while other half (P-420B) received additional NaOH pretreatment, difference in ages was not significant, and the average of three counting runs is quoted here. Probably late Triangle Ware Phase IIIA.

Post-Triangle Ware Phase (Period II)

P-582. Operation AA-31 **2294 ± 60 / 344 B.C.**

Charcoal from a pit in surface upon which Period II structure is built, Operation AA-31, Stratum 2. Coll. 1962. *Comment*: NaOH pretreatment. Might represent end of late Triangle Ware Phase IIIA.

Pisdeli Tepe series, Iran

Pisdeli Tepe (37° N Lat, 45° 29′ E Long), is a small mound lying NE of Hasanlu Tepe in the Solduz Valley, along the S shore of Lake Urmia in Azerbaijan province, Iran. This site, excavated by the Univ. Mus., Univ. of Pennsylvania, in 1958 and 1961, has yielded plain straw-tempered pottery, painted pottery, obsidian blades, bone awls, clay spindle whorls, and an animal figurine, all indicative of a NW Iran variant of the Ubaid of N Iraq. Coll. and subm. by T. C. Young, Jr., Univ. Mus., Univ. of Pennsylvania (Dyson and Young, 1960).

P-505. Operation II, Stratum 10 **5638 ± 85 / 3688 B.C.**

Ashy soil from Operation II, Stratum 10. *Comment*: NaOH pretreatment. Compare with other dates from Pisdeli Tepe: P-130, 929 ± 97 and P-157, 5460 ± 160 (Pennsylvania III).

P-504. Operation II, Stratum 5 **5518 ± 81 / 3568 B.C.**

Ashy soil from Operation II, Stratum 5, E balk. *Comment*: NaOH pretreatment.

P-503. Dalma Tepe, Iran **5986 ± 87**
4036 B.C.

Ashy soil from Operation IV, Stratum 4A, of Dalma Tepe (37° N Lat, 45° 29′ E Long), SW of Hasanlu Tepe in the Solduz Valley, near S shore of Lake Urmia in Azerbaijan province, Iran. The site yielded a ceramic equivalent in date, but typologically distinct from Halaf wares, falling stratigraphically between Hajji Firuz and Pisdeli ware. Stratum is a small lens of ashy soil immediately above Hearth No. 1. Coll. 1961 and subm. by T. C. Young, Jr. (Young, 1962). *Comment*: NaOH pretreatment.

Hajji Firuz series, Iran

Hajji Firuz Tepe (37° N Lat, 45° 29′ E Long), is a small mound SE of Hasanlu Tepe on the S shore of Lake Urmia, in the Solduz Valley of Azerbaijan province, Iran. Excavated by the Univ. Mus., Univ. of Pennsylvania, 1958, 1959, 1961; subm. by T. C. Young, Jr. (Young, 1962).

P-455. Stratum D-15 **7269 ± 86**
5319 B.C.

Charcoal mixed with clay and ash from Stratum D-15, the basal stratum of the lower sounding. Coll. 1958. *Comment*: NaOH pretreatment. Materials associated with this level were tentatively labeled as Neolithic; pottery finds are stratigraphically earlier than Dalma ware in the area.

P-502. Operation V **6895 ± 83**
4945 B.C.

Fine ash and clay from Operation V, Stratum 4, NW corner in upper part of a 3 m deep cut (which did not reach virgin soil). Coll. 1961. *Comment*: NaOH pretreatment. Small rootlets noted throughout the stratum, all visible ones removed.

General comment on Hajji Firuz series: these dates support the stratigraphic field evidence that the stratigraphically lower Hajji Firuz-ware levels predate Dalma ware- and Pisdeli-ware levels, as dated by this laboratory: Dalma Tepe, P-503, 5986 ± 87 (this date list); Pisdeli Tepe, P-157, 5460 ± 160 (Pennsylvania III); P-504, 5518 ± 81; and P-505, 5638 ± 85 (this date list).

P-438. Tal-i-Bakun B, Iran **5990 ± 81**
4040 B.C.

Fine charcoal and dirt from 3 m below surface of newly-cut Japanese trench at Tal-i-Bakun (30° N Lat, 52° 50′ E Long), on the Marv Dasht Plain near Fars, SW of Persepolis, Iran. Associated with handmade straw-tempered pottery of Tal-i-Bakun B type. A prehistoric site, its materials are among the earliest excavated materials of southern Iran. Coll. 1958 and subm. by R. H. Dyson, Jr.

Yarim Tepe series, Iran

Yarim Tepe (37° 15′ N Lat, 55° 11′ E Long), lies on the N bank of the Kara Su River, 9 km S of Gunbad-i-Qabus in NE Iran. The site presents a series of strata estimated to run from Late Iron Age to Early Chalcolithic.

Coll. 1960 and subm. by D. B. Stronach, British Inst. for Persian Studies, Teheran, Iran.

P-509. Early Chalcolithic **3917 ± 156**
1967 B.C.

Charcoal from Trench Y, Level 7A, one of the earliest Chalcolithic levels, just above virgin soil. *Comment*: estimated date: 4000 B.C.; in light of results for P-508, collector is sure that P-509 must have been contaminated.

P-508. Late Bronze Age **3996 ± 242**
2046 B.C.

Charcoal and ash from Trench Z, Level 4, one of the latest Bronze Age levels. *Comment*: estimated date: 2nd millennium B.C.

P-507. Early Iron Age **2850 ± 59**
900 B.C.

Charcoal and ash from Trench D, Level 13, one of the earliest Iron Age levels. *Comment*: NaOH pretreatment. Estimated date: 1200 to 800 B.C.

P-506. Late Iron Age **1773 ± 62**
A.D. 177

Charcoal from Trench A, Pit 1, one of the latest Iron Age levels. *Comment*: NaOH pretreatment.

P-442. Tepe Siahbid, Iran **5815 ± 83**
3865 B.C.

Charcoal and large amounts of clay from Tepe Siahbid (34° 30′ N Lat, 47° 15′ E Long), 10 km ENE of Kermanshah, Iran. This is a small painted-pottery site comparable in time to Susa b-c or the Early Ubaid of S Iraq. Sample is from Operation I, Level I, 1.05 m deep, a well-marked occupation level containing fragmentary evidence of structures. Coll. 1960 and subm. by F. R. Matson, Pennsylvania State Univ. (Braidwood, Howe and Reed, 1961). *Comment*: age of this sample was originally estimated at 8000 to 9000 B.P. Organic carbon analysis of the sample, which consisted mostly of clay, indicated 2.77% carbon, while analysis of clay of the same area showed 0.71% carbon.

Tepe Sarab series, Iran

Tepe Sarab (34° 30′ N Lat, 47° 15′ E Long), lies 7 km ENE of Kermanshah, Iran. A prehistoric site with semi-pit structures, roughly comparable to Jarmo, it represents the earliest village-like occupation of NW Iran. Coll. 1960 and subm. by F. R. Matson (Braidwood, Howe and Reed, 1961).

P-466. South strip, Level 5 **7956 ± 98**
6006 B.C.

Charcoal from black hearth material found in concave layers interstratified with ash and dirt, from Operation I, S strip, Level 5. *Helix salomonica* shells (local land snail) and unidentified animal bones were found with the sample.

P-465. South strip, Level 4 **7605 ± 96**
5655 B.C.

Charcoal from black hearth materials found in concave layers interstratified with ash and dirt, from Operation I, Level 4 of S strip. *Helix salomonica* shells (local land snail) and unidentified animal bones were found with the sample.

P-467. Central strip, Level I **7644 ± 89**
5694 B.C.

Charcoal from black hearth material found under good floor of Level 1, Operation L, central strip. *Helix salomonica* shells and unidentified animal bones were found with the sample.

E. India

P-481. Kalibangan, India **3879 ± 72**
1929 B.C.

Charcoal and dirt from Kalibangan (28° N Lat, 72° 30′ E Long), in Bikaner State of Rajasthan, India. The site consists of two mounds whose surface remains indicate that the site is of Harappan context, but excavations reveal Kot Dijian-like materials as well. Sample is from the mound, KLB-2, Layer 3, 1 m deep. Coll. 1961 by B. B. Lal; subm. by W. A. Fairservis, Jr., Am. Mus. Nat. Hist., New York. *Comment*: NaOH pretreatment.

Chandoli series, India

Chandoli (19° N Lat, 74° E Long), is located 34 mi NNE of Poona, Maharashtra State, India. This is a Chalcolithic site having ceramic links with the sites of Madhya Pradesh and the Deccan of central India. Coll. 1961 and subm. by H. D. Sankalia and S. B. Deo, Deccan College Postgraduate and Research Inst., Poona 6.

P-473. Chandoli No. 216 **3184 ± 68**
1234 B.C.

Charcoal from Trench 7, Layer 2, 2 ft 9 in. below surface. *Comment*: NaOH pretreatment.

P-472. Chandoli No. 190 **3157 ± 68**
1207 B.C.

Charcoal from Trench 8, Layer 2, 2 ft 11 in. below surface. *Comment*: NaOH pretreatment.

P-474. Chandoli No. 188 **3099 ± 185**
2149 B.C.

Charcoal from Trench 9, Layer 2, 2 ft 6 in. below surface. *Comment*: NaOH pretreatment.

Navdatoli series, India

Navdatoli (22° 11′ N Lat, 75° 36′ E Long), is on the S bank of the Narmada River, opposite Maheshwar, in the Nimar district, Madhya Pradesh, India. Coll. 1959 by Deccan College Postgraduate and Research Inst., and the M. S. Univ. of Baroda, Baroda; subm. by H. D. Sankalia. The site is described by Ghosh (1958), Sankalia, Subbarao, and Deo (1958), and Sankalia (1958).

P-475. Navdatoli 3570 **3455 ± 70**
1505 B.C.

Charcoal from the earliest floor, 6 ft 8 in. below surface, near "S" section. *Comment*: NaOH pretreatment.

P-476. Navdatoli 82 **4125 ± 69**
2175 B.C.

Charcoal from remains of burnt wooden post in red debris at NE corner, Trench I, A-17, Layer 7, 4 ft 2 in. below surface. *Comment*: NaOH pretreatment.

General comment on Navdatoli series: compare these dates with those obtained for other samples from the site: P-200, 3457 ± 127; P-201. 3492 ± 128; P-202, 3503 ± 128; P-204, 3449 ± 127; and P-205, 3294 ± 125 (Pennsylvania III).

Eran series, India

Eran (24° 5′ N Lat, 78° 10′ E Long), lies 45 mi WNW of Sagar in Madhya Pradesh, India. The pottery finds associated with these samples are similar to those excavated from the Chalcolithic phase at Navdatoli-Maheshwar in central India. Coll. 1962; subm. by K. D. Bajpai, Director of Eran Excavations, Univ. of Saugar.

P-529. Layer 4 **3868 ± 72**
1918 B.C.

Charcoal and clay from Layer 4, 12 ft 2 in. to 12 ft 4 in. below surface. *Comment*: NaOH pretreatment.

P-525. Layer 15 **3193 ± 69**
1243 B.C.

Charcoal and clay from Layer 15, 17 ft 2 in. below surface, representing Period II, the second level of occupation succeeding the earliest occupation. *Comment*: NaOH pretreatment.

P-526. Layer 18-C **3136 ± 68**
1186 B.C.

Charcoal and clay from Layer 18-C, 19 ft 9 in. to 20 ft 7 in. below surface. *Comment*: NaOH pretreatment.

P-527. Layer 19 **2515 ± 58**
565 B.C.

Charcoal and clay from Layer 19, 22 ft 3 in. to 22 ft 7 in. below surface. *Comment*: NaOH pretreatment.

P-528. Layer 20 **2878 ± 65**
928 B.C.

Charcoal and clay from Layer 20, 24 ft to 24 ft 8 in. below surface. *Comment*: NaOH pretreatment. Sample was very damp; mold growing on one portion was removed before pretreatment.

F. West Pakistan

P-524. Kile Gul Mohammad, Baluchistan **5474 ± 83**
3524 B.C.

Charcoal from Kile Gul Mohammed (30° N Lat, 69° E Long), Quetta-

Pishin district, former province of Baluchistan, West Pakistan. Sample was taken from floor of room located between walls VII and VIII, in Phase 23, Sec. I, Q-24. Phase 23 is in KGM-I context, a preceramic horizon at this site. Coll. 1950 and subm. by W. A. Fairservis, Jr. (Fairservis, 1956). *Comment*: NaOH pretreatment.

P-478. Niai Buthi, Baluchistan — **3740 ± 64**, **1790 B.C.**

Charcoal and dirt from Niai Buthi (26° 10′ N Lat, 66° 15′ E Long), in the Las Bela district, Welpat tahsil, former province of Baluchistan, West Pakistan. The sample, apparently a hearth remnant, was found in association with Kulli pottery on the S portion of W face of the site. Coll. 1960 and subm. by Fairservis. *Comment*: NaOH pretreatment.

Damb Sadaat series, Baluchistan

Damb Sadaat (28° 15′ N Lat, 68° 50′ E Long), is located in the Quetta-Pishin district, former province of Baluchistan, West Pakistan. Coll. 1950 and subm. by Fairservis (Fairservis, 1956).

P-522. Damb Sadaat II, Phase 7 — **4378 ± 196**, **2428 B.C.**

Charcoal and ash from Phase 7, Sec. II, Cut G-T, Q-8, in Damb Sadaat II context. *Comment*: NaOH pretreatment.

P-523. Damb Sadaat II, Room A — **4029 ± 74**, **2079 B.C.**

Charcoal from hearth in Room A, Q-8, in Damb Sadaat II context. *Comment*: NaOH pretreatment.

EUROPE

A. Switzerland

P-456. Grave LXII, Schiers, Switzerland — **1583 ± 58**, **A.D. 367**

Wood from Grave LXIV, one of more than 70 found near an early Christian church at Schiers (Grisons) (46° 58′ N Lat, 9° 41′ E Long), Switzerland. The burials were covered by 3 ft of rock debris from mountain slides. Objects found in the graves have indicated an age range of 4th to 6th centuries A.D. Coll. 1960 by Hans Erb, Ratusches Mus.; subm. by H. H. Staub, Physikalisches Inst. der Univ. Zurich (Der Frei Ratier, 1960; Bern II). *Comment*: compare with other dates from this site: B-165, 1680 ± 100; B-166, 1430 ± 80; and B-168, 1640 ± 100 (Bern II).

CENTRAL AMERICA

A. Mexico

P-409. Palenque, Excavation 69 — **4175 ± 223**, **2225 B.C.**

Charcoal and dirt from Palenque (17° 31′ N Lat, 91° 59′ W Long), a Maya site in the state of Chiapas, Mexico. Sample is from Excavation 69, Level 17—lower zone, 2.85 m to 4.20 m below surface, the lowest culture-

bearing deposit of the excavation. Coll. 1959 and subm. by R. L. Rands, Univ. of Mississippi, University, Miss. (Rands, 1961, in press; Ruz, 1958). *Comment*: compare with dates obtained for other samples from this site: 0-396, 1400 ± 100; 0-397, 1450 ± 100; 0-639, 1575 ± 105; and 0-641, 1550 ± 105 (Rands, written communication, 1961). These samples are representative of the Classic period at Palenque, while P-409 is material from the earliest culture-bearing deposit of the excavation.

SOUTH AMERICA

A. Bolivia

Kalasasaya series, Bolivia

Kalasasaya (16° 35′ S Lat, 68° 40′ W Long), is located near Tiwanaku, Ingavi province, Bolivia. The site was excavated 1957-58 by the Centro de Invest. Arqueologicas en Tiwanaku under direction of C. Ponce S.; subm. by Ponce (Ponce, in press; Pennsylvania III).

P-532. Epoch I **1653 ± 61**
A.D. 297

Charcoal and dirt from Pit E-17, 364 cm deep.

P-534. Epoch II **1866 ± 62**
A.D. 84

Charcoal and dirt from Pit I-12, 215 to 217 cm deep.

P-531. Epoch III **295 ± 192**
A.D. 1655

Charcoal and ash from S part of Pit G-15, Layer 3, consisting of pale reddish-brown clay, 85 to 100 cm deep.

P-533. Epoch IV **778 ± 133**
A.D. 1172

Charcoal from Pit F-8, over paved floor of house, 110 to 135 cm deep.

B. Brazil

Sambaqui do Macedo series, Brazil

Sambaqui do Macedo (30° S Lat, 50° W Long), is a shellmound site lying ca. 2.5 km S of the Bay of Paranagua and 520 m NE of Alexandra, in Municipio de Parangua, Parana, Brazil. The base of the mound lies on an ancient beach at least 1.6 m above the present shore line, and excavations in 1960 by the State Univ. of South Dakota and the Univ. of Parana reveal a mound height of 10.26 m at center. The samples are from charcoal remains of fires within the midden layers of the mound. The levels listed below are arbitrary, the oldest expected to date ca. 3000 B.P. If the dates are correlated with Fairbridge's chart, the raised beach under the mound may have been deposited during the Younger Peron high (ca. 4000 to 3600 B.P.). Coll. by W. R. Hurt, State Univ. of South Dakota, Vermillion, S. D., and Oldemar Blasi, Univ. of Parana, Curitaba, Parana, Brazil; subm. by Hurt (Hurt, 1962; Hurt and Blasi, 1960).

P-482. Sambaqui do Macedo, 0.75 m to 1.25 m **3306 ± 61**
1356 B.C.

Fine charcoal and dirt from level 0.75 m to 1.25 m, quadrant A-B, 2-4.

P-483. Sambaqui do Macedo, 1.25 m to 2.25 m **3344 ± 61**
1394 B.C.

Fine charcoal and dirt from level 1.25 m to 2.25 m, quadrant A-B, 2-4.

P-485. Sambaqui do Macedo, 2.25 m to 2.75 m **3271 ± 48**
1321 B.C.

Fine charcoal and dirt from level 2.25 m to 2.75 m, quadrant A-B, 2-4.

P-486. Sambaqui do Macedo, 2.75 m to 3.25 m **3373 ± 58**
1423 B.C.

Fine charcoal and dirt from level 2.75 m to 3.25 m, quadrant A-B, 2-4.

P-487. Sambaqui do Macedo, 3.25 m to 4.00 m **3284 ± 61**
1334 B.C.

Fine charcoal and dirt from level 3.25 m to 4.00 m, quadrant A-B, 2-4.

P-488. Sambaqui do Macedo, 4.00 m to 4.75 m **3361 ± 70**
1411 B.C.

Fine charcoal and dirt from level 4.00 m to 4.75 m, quadrant A-B, 2-4.

P-489. Sambaqui do Macedo, 4.75 m to 5.50 m **3424 ± 62**
1474 B.C.

Fine charcoal and dirt from level 4.75 m to 5.50 m, quadrant A-B, 2-4.

P-500. Sambaqui do Macedo, 5.50 m to 6.50 m **3496 ± 56**
1546 B.C.

Fine charcoal and dirt from level 5.50 m to 6.50 m, quadrant A-B, 2-4.

Lagoa Santa series, Brazil

The samples listed here are from Rock Shelter No. 6 (19° 40′ S Lat, 33° 10′ W Long), Cerce Grande, Lagoa Santa region of Minas Gerais, Brazil. The site was excavated in 1956 by the State Univ. of South Dakota, Vermillion, S. D., and the Mus. Nac., Rio de Janeiro. Vertical distribution of the levels is 25 cm below surface for Level 2 to 2 m for Level 7. Subm. by W .R. Hurt (Hurt, 1960, 1962; Walter, no date).

P-521. Levels 6 and 7 **9720 ± 128**
7770 B.C.

Charcoal from Levels 6 and 7 (Squares TE-Q 1-2 and TE-Q 2-3), representing the earliest levels of human occupation at this site.

P-519. Levels 2 and 3 **9028 ± 120**
7078 B.C.

Charcoal from Levels 2 and 3 (Square TA-Q 1-2).

General comment on Lagoa Santa series: materials were expected to produce dates roughly similar to those obtained for Lagoa Funda cave materials, per-

haps 3000 B.P. The above dates, therefore, cannot be considered definitive until further investigation.

Sambaqui de Gomes series, Brazil

Sambaqui de Gomes (25° 20′ S Lat, 84° 45′ W Long), is a shellmound site lying off the Bay of Antonina, 1000 m NE of the railroad station of Saquarema, Municipio of Morretes, Parana, Brazil. Samples are from occupational and hearth levels within the shellmound. Coll. 1962 by J. W. Rauth, Mus. de Arquelogia, Paranagua, Parana, Brazil; subm. by W. R. Hurt (Hurt, 1962).

P-540. Sambaqui de Gomes, 25 to 75 cm **4490 ± 136**
2540 B.C.

Charcoal, clay and powdered shell from level of recent occupation, 25 to 75 cm.

P-541. Sambaqui de Gomes, 150 cm **4487 ± 76**
2537 B.C.

Charcoal, clay and powdered shell from 150 cm level.

P-588. Manguerias site, Rio Japurá, Brazil **1318 ± 59**
A.D. 632

Charcoal from the Manguerias village site (1° 50′ S Lat, 69° 10′ W Long), in the Terra Preta (black earth) region of the left side of Rio Japurá, a tributary of the Amazon River, 60 km E of the Colombian-Brazilian border. Sample is a combination of materials from the 60 to 75 cm levels of Cut I (60 m from bank of Rio Japurá) and Cut II (110 m from Rio Japurá) of the Japurá phase. Coll. 1959 and subm. by P. P. Hilbert, Mus. Paraense Emilio Goeldi, Inst. Nac. de Pesquisas da Amazonia, Belem do Para, Brazil.

C. Peru

Peruvian coastal series, Peru

The samples presented in this series represent ceramically-linked sites of the Ica and Nasca Valleys of the Peruvian coast. Coll. 1958 and subm. by D. T. Wallace, Univ. of Oregon, Eugene, Oregon.

Ica Valley samples:

P-515. Cerro Max Uhle, Nasca 3 phase **2014 ± 62**
64 B.C.

Cotton stock and carbonized cloth from Tomb P of Cerro Max Uhle (14° 05′ S Lat, 75° 39′ W Long), in the Ocucaje Basin of the lower Ica Valley, Peru. The material was found with vessels of Nasca 3 phase, representing the height of "Monumental" or "A" style of Nasca ceramic tradition (Strong, 1957). *Comment*: expected to date ca. A.D. 250, less than 150 yr earlier than P-513 below, and approximately the same age as Nasca A materials previously dated: C-460, 1314 ± 250 (Chicago I); and L-268H, 1630 ± 80 (Lamont III).

P-512. Callango-Uyujaya, Epigonal phase **1058 ± 52**
A.D. 892

Cotton cloth from the interior of a mummy bundle from an unnamed site (14° 04′ S Lat, 75° 39′ W Long), on the slopes of the lower Ica Valley be-

tween Callango and Uyujaya, Peru. The mummy bundle was one of several found in a cache, and identified by bundle-form and associated textiles and ceramics as Epigonal, the closing phase of the Middle Horizon. This period marks the end of Wari stylistic predominance, and the reformation of essentially local styles (Strong, 1957; Menzel, 1958). *Comment*: expected to date ca. A.D. 900, later than P-511, below.

Upper Ica Valley samples:

These samples are vegetal remains from habitation refuse excavated at the Cerrillos site on the slopes of the upper Ica Valley above the pueblo of Pampa de la Isla (13° 55′ S Lat, 75° 40′ W Long), Peru (Wallace, 1962).

P-516. Cerrillos, Early Cerrillos phase **2408 ± 214 / 458 B.C.**

Vegetal remains from Cut 2, Pit C, Level 3, the basal level at this site, containing materials of the Cerrillos phase and underlying the Isla phase. The Cerrillos phase is representative of the earliest known phase of the Paracas style in a period of intensive Chavin stylistic influence from the north. *Comment*: expected to date ca. 500 B.C.

P-518. Cerrillos, Early Isla phase **2195 ± 64 / 245 B.C.**

Vegetal material from Cut 5, Pit B, Level 7a, associated with first major construction phase of Isla phase. Materials at this level represent the beginning of a series of major construction phases marking the second major occupation period of the site, and constitute the Early Isla phase, an early stage in the local development of the Paracas style. *Comment*: NaOH pretreatment. Material expected to date ca. 300 B.C., perhaps 100 to 300 yr later than P-516, 50 to 100 yr earlier than P-517, and at least 200 yr earlier than Late Paracas materials dated as: W-422, 2080 ± 160 USGS IV); L-268A, 1910 ± 80 (Lamont III); L-335C, 1840 ± 100 and L-335D, 1940 ± 100 (Lamont IV).

P-517. Cerrillos, Late Isla phase **2302 ± 125 / 352 B.C.**

Vegetal remains from Cut 4, Pit A, Level 1, representing the third major construction phase of the Isla phase. *Comment*: NaOH pretreatment. Material was expected to date ca. 200 B.C., perhaps 50 to 100 yr later than P-518.

Nasca Valley samples:

These two samples are from the Lopez cemetery lying on the N side of Hacienda Cahuachi (14° 55′ S Lat, 74° 39′ W Long), ca. 15 km down river from the town of Nasca in the Nasca Valley, Peru (Strong, 1957; Menzel, 1958).

P-513. Hacienda Cahuachu, Nasca 4 phase **1968 ± 62 / 18 B.C.**

Llama or alpaca wool from Tomb 3, associated with Nasca 4 ceramics, indicative of the first full development of the "Monumental" or "A" style of Nasca ceramics. *Comment*: expected to date ca. A.D. 350, approximately the same age as Nasca A style materials mentioned in P-515 comment, above.

P-511. Hacienda Cahuachi, Nasca 9 **1345 ± 118**
605 B.C.

Cotton cloth from a mummy bundle found in Tomb 2 with Nasca 9 phase ceramics which mark the end of the Nasca tradition and are coeval with full-scale penetration of the Wari-Pacheco influence from the highlands. *Comment*: expected to date ca. A.D. 800, in line with materials dated from Huaca del Lora: L-268E, 1100 ± 70; L-268F, 1170 ± 70; and L-268G, 1400 ± 80 (Lamont III); and L-335F, 1200 ± 90 (Lamont IV).

D. Miscellaneous

Potsherd series

The samples listed below are potsherds from the tropical forest areas of Brazil, Ecuador, and Venezuela. The potsherds were tempered with organic matter: powdered charcoal; *cariapé*, or ash derived from burning the siliceous bark of trees belonging to the genera Bignoniacea, Moquilea, Licania, and Turivia; or *cauixi* obtained from burning a fresh-water sponge of the genus Parmula with siliceous spicules. The samples were dated in order to determine whether or not such materials were suitable for C^{14} dating, with the thought that, if so, there would be no question of the association of the dated materials with the potsherds. This laboratory had previously dated two samples (P-160, of charcoal and charred tubers, and P-162, of charred nuts or seeds, Pennsylvania III) from the tropical forests of Venezuela, and it was thought that they might serve as controls for the dating of associated organic-tempered potsherds from the same excavation levels. In addition, a number of other potsherd samples were dated for which we have no true controls other than archaeological estimates. Subm. by Clifford Evans, U. S. Natl. Mus., Washington (Evans and Meggers, in press; Pennsylvania III).

Venezuelan sample group

P-261. Nericagua culture, 1.0 to 1.2 m **1263 ± 54**
A.D. 687

Potsherds tempered with *cariapé* from Sitio Martinez (4° 05′ N Lat, 67° 50′ W Long), Rio Orinoco, Territory of Amazonas, Venezuela. Samples are from Mound 2, Cut 1, 1.0 to 1.2 m. Coll. 1957 by C. Evans, B. J. Meggers, and J. M. Cruxent (Evans, Meggers, and Cruxent, 1960). *Comment*: carbon content of the sample was ca. 0.6%. Compare with P-162, 619 ± 103 (Pennsylvania III), composed of charcoal and charred tubers, from same cut and level of Mound 2, associated with these potsherds, and expected to be of approximately the same age. Difference in ages was significant: 644 ± 115 = 5.6 sigma.

P-262. Nericagua culture, 20 cm to 40 cm **1032 ± 54**
A.D. 918

Potsherds tempered with *cariapé* from Sitio Martinez, Cut 4, 20 cm to 40 cm. *Comment*: carbon content of sample was ca. 1.0%. Compare with P-160, 1189 ± 93 (Pennsylvania III), composed of charred nuts or seeds, from same cut and level, associated with these potsherds, and expected to be of

approximately the same age. Difference in ages was little more than significant, 1.39 sigma.

Brazilian sample group

P-373. Coari site, 0 to 15 cm **800 ± 47**
A.D. 1150

Potsherds tempered with *cariapé* from the Coari site (4° 06′ S Lat, 63° 08′ W Long), at the mouth of the Coari River, a tributary of the Amazon River, state of Amazonas, Brazil. Sample is from Cut 1, Level 0 to 15 cm. Coll. 1958 by P. P. Hilbert (Meggers and Evans, 1961). *Comment*: carbon content of the sample was ca. 1.8%. The archaeological excavations show two distinct occupations at this site. On the basis of ceramic affiliations, the second occupation (polychrome horizon of a Napo-like culture) was one stage of a downriver movement from sub-Andean areas toward an area known to have an established culture from A.D. 1200 to 1400. This date agrees with the archaeological estimate for the second occupation—slightly before A.D. 1200.

P-370. Coari site, Level 15 to 30 cm **1187 ± 48**
A.D. 763

Potsherds tempered with *cauixi* from Cut 2, Level 15 to 30 cm. *Comment*: carbon content of this sample was ca. 1.2%. This date roughly matches the archaeological estimate of A.D. 100 to 800 for the first occupation (Incised Rim horizon style) for this site (see P-373 comment), although earlier than expected.

P-372. Itacoatiara site **1864 ± 58**
A.D. 86

Potsherds tempered with *cauixi* from Itacoatiara site (3° 06′ S Lat, 58° 22′ W Long), on the Amazon River, state of Amazonas, Brazil. Coll. 1957 by P. P. Hilbert. *Comment*: carbon content of the sample was ca. 0.3%. Pottery from this level belongs to the Late Incised and Punctate horizon, estimated to appear after A.D. 1000.

P-406. Manacapuru site **1525 ± 58**
A.D. 425

Potsherds tempered with *cauixi* from Manacapuru site (3° 18′ S Lat, 60° 37′ W Long), on N bank of the Amazon River, upriver from Manaus, state of Amazonas, Brazil. Sample is from Level 0 to 15 cm. *Comment*: carbon content of sample was ca. 0.6%. This sample falls in the same archaeological context (Incised Rim horizon) as does P-370, above.

Ecuador sample group

These samples were collected at Nueva Armenia (0° 53′ S Lat, 75° 28′ W Long), on the Rio Napo, Napo-Pastaza province, Ecuador. Coll. 1958 by C. Evans and B. J. Meggers (Meggers and Evans, 1958).

P-269. Nueva Armenia, Cut 1 **771 ± 51**
A.D. 1179

Potsherds tempered with charcoal fragments from Cut 1, Level 0 to 15 cm. *Comment*: carbon content of the sample was ca. 1.4%. Ceramic affiliations of this site resemble the earliest ceramic horizon of Marajoara pottery on

Marajo Island downriver from this site. This site is estimated to be one stage of the downriver movement from sub-Andean areas toward Marjo Island which is known to have an established culture from A.D. 1000 to 1200. The date is in agreement with the archaeological estimate for the Napo culture—slightly before A.D. 1200.

P-347. Nueva Armenia, Broadside B **782 ± 53**
A.D. 1168

Potsherds tempered with charcoal fragments from Broadside Cut B. *Comment*: carbon content of the sample was ca. 0.8%. This date is in agreement with the archaeological estimate (see P-269 comment).

General comment on potsherd series:

Sample	Temper	% Carbon	Age in A.D. Years	Evaluation
P-261	*cariapé*	0.6	687 ± 54	P-162 from same level, A.D. 1339 ± 103
P-262	*cariapé*	1.0	918 ± 54	P-160 from same level, A.D. 769 ± 93
P-373	*cariapé*	1.8	1150 ± 47	Estimated A.D. 1200; agrees with P-269 and P-347 of related complex.
P-269	charcoal	1.4	1181 ± 51	Estimated A.D. 1200, agrees with P-373 and P-347, related in complex.
P-347	charcoal	0.8	1168 ± 53	Estimated A.D. 1200, agrees with P-269 and P-373, related in complex.
P-372	*cauixi*	0.3	86 ± 58	Estimated post-A.D. 1000.
P-370	*cauixi*	1.2	763 ± 48	Estimated A.D. 100 to 800.
P-406	*cauixi*	0.6	425 ± 58	Estimated A.D. 100 to 800.

The *cariapé*-tempered potsherds in this survey seem unreliable when compared with their charcoal counterparts. While P-262 barely agrees with P-160 within the errors quoted, P-261 yielded a date far earlier than its counterpart, P-162. It should be noted that the carbon contents of P-261 and P-262 were 1.0% or less, while that for the single *cariapé*-tempered sample in agreement with its archaeological estimate, P-373, was 1.8%.

The charcoal-tempered samples were generally in agreement with their respective archaeological estimate, with carbon contents of 0.8% or more.

The *cauixi*-tempered samples, with the exception of P-372, were in agreement with their archaeological estimates. The carbon content of P-372 was only 0.3%, while that of the other samples was 0.6% or more. In general,

then, it would seem that where the carbon content of the sample is great enough, 1.0% or more, organic-tempered potsherds may well be suitable for C^{14} dating.

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