

ARIZONA RADIOCARBON DATES X

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INTRODUCTION

Routine radiocarbon analyses were last reported for the Laboratory of Isotope Geochemistry at the University of Arizona in 1971 (Haynes, Grey, and Long, 1971), and a special date list on packrat middens appeared in 1978 (Mead, Thompson, and Long, 1978). This list presents results obtained from our gas proportional counting facility before its major renovation and before the addition of a liquid scintillation counting system. The characteristics of these new systems will be described in the next date list.

The majority of the results presented here are for extramural samples (submitted by researchers not associated with this laboratory) and were analyzed in conjunction with the service aspects of our facility. Results obtained from the radiocarbon analysis of bristlecone pine tree rings, which is the main thrust of our intramural research¹ on radiocarbon fluctuations in atmospheric CO₂ and their relationship to climate, will be presented elsewhere.

All the ages reported here are based on the ¹⁴C half-life of 5568 years, using 95% of the activity of NBS Oxalic Acid I as the modern value. The activities of samples of terrestrial organic material have been normalized to account for the difference between the measured $\delta^{13}\text{C}$ and -25‰ PDB, as recommended by Stuiver and Polach (1977). Errors, based on counting statistics, are expressed as $\pm 1\sigma$; samples counting within 2σ of background are reported as non-finite. The precision of the ¹³C determinations may be taken to be $\pm 0.1\text{‰}$.

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SAMPLE DESCRIPTIONS

I. GEOCHEMICAL SAMPLES

Peterson Ranch series, Arizona

Various samples near or in pond in Cochise Co, Arizona (31° 27' N, 110° 24' W). Coll 1968 by C V Haynes, R H Russel, and J Bequaert; subm by C V Haynes, Anthropology Dept, Univ Arizona.

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A-982C. Tufa encasing barbed wire	630 ± 70
On surface.	
A-983. Organic mat	4300 ± 150
20cm below surface.	
A-984A. Living chara	Modern
Bottom of pond, near shore.	
A-984C. Living chara	Modern
Bottom of pond, near shore.	
A-985. Tufa	Modern
Road cut surface containing sandy clay.	
A-987. Water	Modern
From pond surface at 16°C.	

General Comment: ¹⁴C distribution was studied in this modern pond environment for a better understanding of the dating of marl, tufa, shell, and organic matter from fossil deposits. In this environment, carbonate deposits, bicarbonate in water, and organic matter deriving carbon from the water, all gave contemporary ¹⁴C analyses.

Tanquary Fiord series, Ellesmere Island

Living marine mollusk shells from fiord (81° 25' N, 77° 00' W) at 10 to 40m depth in direct contact with Arctic water. Analyses will help evaluate accuracy of shell dates on raised Arctic shorelines (see, eg, Hattersley-Smith and Long, 1967). Coll and id 1968 by M Curtis; subm by Austin Long.

A-996. <i>Astarte borealis</i>	400 ± 60
A-997. Mixed species	620 ± 90

Monkey Springs series, Arizona

Samples collected in and around Monkey Springs, Santa Cruz Co (31° 38' N, 110° 42' W) Arizona. Coll 1969 by E Wallick and Austin Long; subm by Austin Long.

A-1009. Aquatic moss	7935 ± 90
Sample 10cm below water; id by P S Martin.	
A-1084. <i>Lilaeopsis recurva</i>	8490 ± 100
Sample growing under water; id by T Van Asdall.	
A-1085. Spring water	8140 ± 70
A-1086. Whole plant material, submerged	5535 ± 80
A-1267. Tufa, encrusted on mesquite	7910 ± 400
A-1268. Tufa	6740 ± 350

A-1055. Why, Arizona **9520 ± 400**

Water sample from well in Pima Co, Arizona (32° 16' N, 112° 44' W). Sample taken from below 274m. Coll 1969 by L C Halpenny; subm by Austin Long. *Comment:* tertiary volcanics go down to 274m. Sample (deepest water yet obtained) is from sand aquifer 274 to 373m below surface.

A-1245. Little Colorado River **22,020 ± 760**

Travertine, now depositing, from the confluence of Little Colorado R and Colorado R, Arizona (36° 12' N, 112° 10' W). Coll 1971; subm by Austin Long. *Comment:* sample analyzed to answer question: does water supersaturated in CaCO₃ exchange CO₂ with the atmosphere? Answer: A max of 10% of carbon could be from the atmosphere. From the probable age of the groundwater, the figure is probably much closer to zero.

A-1251. Ash Meadows, Nevada **160.4 ± 4.4‰ modern**

Plant material 30cm below water surface, Big Spring, Ash Meadows, Nye Co, Nevada (36° 29' N, 116° 21' W). Coll and subm 1971 by Austin Long.

A-1255. Saratoga Springs, California **7510 ± 40**

Aquatic plants submerged just below water surface near source of spring at Devils Hole (36° 45' N, 116° 28' W), California. Coll and subm 1971 by Austin Long.

Great Salt Lake series, Utah

Carbonates in clay from core in lake sediments (41° 10' N, 112° 40' W) Box Elder Co. Samples relate to pollen analysis of sediments by P J Mehringer, Jr, Dept Anthropol, Washington State Univ, Pullman. A-1241 represents level containing ash assumed to be correlative with Mt Mazama in Hogup Spring (this list) and will give approx correction factor for this series of carbonate dates. Coll 1970; subm by P J Mehringer.

A-1244.	0.45 to 0.49m	5470 ± 90 $\delta^{13}C = +2.6‰$
A-1243.	0.77 to 0.80m	6370 ± 80 $\delta^{13}C = +2.2‰$
A-1242.	1.22 to 1.26m	8200 ± 170 $\delta^{13}C = +2.5‰$
A-1241.	1.64 to 1.68m	9760 ± 120 $\delta^{13}C = +1.6‰$

Watertown series, New York

Charcoal samples from 20cm below surface at Jefferson Community Coll, New York (43° 58' N, 75° 57' W). See Rippeteau (1971). Coll 1971 by B E Rippeteau; subm by Austin Long. *Comment:* "dead" charcoal

left in simulated archaeological site for one year to check for contamination and recovered by standard archaeological techniques. Placed in red sandy loam with pH = 4.

A-1263. Sample #1 >**25,000**

A-1264. Sample #2 >**33,000**

Arizona well water series

Well water samples coll from Gila Co, Arizona (33° 24' N, 110° 48' W). Coll 1972; subm by R D Gale, Tonto Natl Forest Service, Arizona.

**A-1341. Water from 148m depth
in 305m deep well** **20,460 ± 630**

Coll at 29°C and pH = 7.65.

A-1342. Water from bottom of 152m deep well **8860 ± 230**

Coll at 28°C and pH = 7.94.

II. GEOLOGIC SAMPLES

A-820. Univ Arizona campus, Arizona **12,900 ± 400**

Caliche from Pima Co, Arizona (32° 15' N, 110° 58' W) 0.6m under surface, overlain by ashy fill material. Coll 1965; subm by D C Grey. *Comment:* date corresponds to 20.1% modern.

A-852. Alton, Utah **750 ± 200**

Wood (*Pinus ponderosa*) from slump block in South Roundy landslide (37° 26' N, 112° 26' W) in Kane Co. Specimen from 4.3m below surface in slumped Tropic Shale. Coll 1966 by J Shroder and H Goode; subm by R L Mauger, Dept Geol, East Carolina Univ. *Comment:* analysis to test hypothesis that major landslides in Utah occurred during moister climates (*ie*, pluvial).

A-910. SP Crater, Arizona **9390 ± 500**

Surficial caliche on basalt boulders from exposed surface of marginal (oldest) facies of flows assoc with SP Crater (35° 35' N, 111° 33' W) near Flagstaff in Coconino Co. Coll 1967; subm by P E Damon, Dept Geosciences, Univ Arizona. *Comment:* sample was acid-leached before analysis to remove most recent ¹⁴C accumulation. Unlike pedogenic carbonate studied by Williams and Polach (1969), this caliche should give min age for flow because of nonavailability of stratigraphically higher carbonate for redeposition.

Fairbanks series, Alaska

Organic matter in silty permafrost from Ready Bullion Creek mining exposure (64° 51' N, 148° 01' W), 19km W of Fairbanks. All samples coll and subm 1967 by T L Péwé, Arizona State Univ, Tempe.

A-912A. No. 173 >**25,000**

Organic matter from foliated ice wedge. In permafrost mud, 2.1m below top of formation.

A-921B. Alkali soluble fraction from A-921A >25,000

A-922A. No. 174 >25,000

Organic matter from foliated ice wedge. In permafrost mud, 2.1m below top of formation.

A-922B. Alkali soluble fraction from A-922A >25,000

Samples below collected as above except from Eva Creek mining exposure of same formation (64° 51' N, 148° 00' W) 16km W of Fairbanks.

A-923A. No. 175 15,700 ± 1700

Organic matter from foliated ice wedge, 2.7m below top of formation. *Comment*: in light of A-923B, below, this sample probably contains more-recent organic contamination. Correct age is probably >25,000.

A-923B. Alkali soluble fraction from A-923A >20,000

A-924. No. 176 >25,000

Twigs from 2.7m below top of formation and in ice wedge.

General Comment (TPL): all samples coll from late Pleistocene muck low in organic matter and analyzed in 0.5L counter.

Estancia series, New Mexico

Organic samples from stratigraphic sections in Lake Estancia sediments (34° 39' N, 105° 58' W), Torrance Co. Extensive stratigraphic and paleobiologic/paleoclimatic analysis by F W Bachhuber yielded climatic chronology for basin extending pioneer work of Meinzer (1911). Coll 1968 by F W Bachhuber; subm by Austin Long.

A-1002. No. E-20-NNW-11a 11,740 ± 900

Fish bones (probably *Salmo clarki*) from lower part of Zone E, 1.5m above present playa surface. *Comment (FWB)*: should date last glacial/pluvial max in central New Mexico.

A-1001. No. LP-M2-E-3 >33,000

Carpels, peduncle fragments, and seed coats of *Ruppia maritima* from lower part of Zone F, 30cm below present playa surface. *Comment (FWB)*: should date interstadial preceding last high-level lacustrine stage.

Lake Tuborg series, Ellesmere Island

Marine shells, id by J Rosewater, Smithsonian Inst, from lake at head of Antoinette Bay (81° 00' N, 75° 31' W) NWT. Subm by Austin Long.

A-1047. *Hiatella arctica* Linné 5300 ± 150

From 46m above lake surface. Coll 1968 by A Judge.

A-1065. *Mya truncata* Linné 4810 ± 70

From 4m above lake surface. Coll 1969 by Austin Long.

General Comment: terraces from which shells were sampled represent pre-Lake Tuborg marine nearshore sediment. Lake Tuborg was subsequently created by advance of glacier across fiord (see Hattersley-Smith, 1969).

A-1044. Guatemala **>41,000**

Charcoal from fresh quarry cut in white block-pumice (14° 31' N, 90° 27' W) 4.5m below present surface in Quebrada La Perla, 5km SW of San José Pinula. Coll 1969 by C Pineo and M Carr; subm by W I Rose, Jr, Dept Earth Sci, Dartmouth. *Comment:* glowing avalanche deposit which charred this material is apparently not contemporaneous with those in Chimaltenango and Quezaltenango Valleys dated at 28,000 to 38,000 yr BP (Bonis *et al*, 1966).

Willcox Playa series, Arizona

Carbonate deposits on NW edge of playa (32° 10' N, 109° 56' W) Cochise Co. Coll 1971 and subm by Austin Long.

A-1233. Calcrete **16,050 ± 310**
13.3 ± 1.4‰ modern
 $\delta^{13}C = -1.6‰$

From beach ridge in Big Wash channel cut.

A-1234. Apparent marl **21,510 ± 640**
5.6 ± 1.2‰ modern
 $\delta^{13}C = -1.4‰$

Sample represents lagoonal deposit 100m upstream from ridge in Big Wash stream cut.

General Comment: times of deposition of carbonates relate to events in history of Willcox Playa and its progenitor, Lake Cochise (Long, 1966). Twenty-two samples of carbonates from Willcox Playa are pub in Arizona IV and V (R, 1963, v 5, p 283-301; R, 1964, v 6, p 91-107).

A-1119. Huatabampito, Mexico **1400 ± 100**
 $\delta^{13}C = +0.4‰$

Marine shell near coast of Sinaloa (26° 10' N, 110° 00' W) from surface 60m above present sea level and 3km inland from present beach. Coll 1970 and subm by D L Bryant, Dept Geosciences, Univ Arizona. *Comment:* this sample and A-1120 relate to uplift of Mexican coast.

A-1120. Desemboque, Mexico **1330 ± 200**
 $\delta^{13}C = +1.2‰$

Marine shell near coast of Sonora (30° 30' N, 113° 30' W) from surface 75m above present sea level and 1km inland from present beach. Coll 1970 and subm by D L Bryant. *Comment:* this sample and A-1119 relate to uplift of Mexican coast.

Walker Lake series, Arizona

Organic matter in sediment from dry lake (35° 30' N, 111° 40' W) in Coconino Co. Coll 1971 and subm by R W Berry, School of Forestry, Northern Arizona Univ, Flagstaff.

A-1199. 0 to 5cm depth **15,440 ± 250**
 $\delta^{13}C = -14.6\text{‰}$

A-1200. 20 to 25cm depth **16,580 ± 200**
 $\delta^{13}C = -13.7\text{‰}$

A-1201. 25 to 30cm depth **16,510 ± 200**
 $\delta^{13}C = -14.4\text{‰}$

General Comment: pollen analysis by Berry implies Hypsithermal climate for levels sampled.

A-1458. Red Cave, Arizona **Modern**
 Stalagmite, outer surface from Pima Co, Arizona (31° 52' N, 110° 27' W). Coll 1973 and subm by J I Mead.

A-1457. Colossal Cave, Arizona **>22,000**
 Outer layer of dripstone found in Pima Co, Arizona (32° 04' N, 110° 38' W). Coll 1973 and subm by Robin White, Dept Geosciences, Univ, Arizona.

Quezaltenango Valley series, Guatemala

Carbonized wood assoc with ash flows. Coll 1974 and subm by W I Rose, Dept Geol & Geol Engineering, Michigan Technol Univ, Houghton.

A-1525. GU/N1-1 **>37,700**
 Wood from single log, 6m below top of ash flow. Roadcut 1.8km S of Totonicapan, 19km NE of Quezaltenango at 2480m elev (14° 53' N, 91° 22' W).

A-1526. GU/SJO-10 **>37,700**
 Wood from single log from middle of 10cm-thick ash flow. Roadcut 1km E of Ostcuncalco, 12km W of Quezaltenango at 2470m elev (74° 51' N, 91° 36' W).

A-1527. GU/CA-2 **>37,700**
 Wood from single log from upper 3m of ash flow. Near Pachaj, 7km ESE of Quezaltenango, at 2350m elev (14° 47' N, 91° 27' W).

Algodones Fault series, Arizona

Soil carbonate nodule samples from 1.5m depth in dune sand on lee side of fault scarp. Nodules accumulated after last episode of displacement of fault; 19km SE of Somerton, Arizona (32° 31' 25" N, 114° 32' 20" W).

A-1554. 75S Trench 2 **23,310 ± 690**

A-1555. 98N Trench 4 **21,910 ± 610**

Conclusion: No Holocene movements on this part of Algodones Fault.

III. PALFONTOLOGIC SAMPLES

Stanton's Cave series, Arizona

Wood, dung, and bone from cave in Grand Canyon (36° 31' N, 111° 51' W) 60km downstream from Lee's Ferry in Coconino Co. Coll 1969 and subm by R C Euler, Grand Canyon Natl Park, B Harritt, P S Martin, C W Ferguson, and Austin Long, Univ Arizona.

A-1184. SC1	1500 ± 50 $\delta^{13}C = -22.5\text{‰}$
<i>Pinus edulis</i> , surface, limit of mapped area in rear of cave.	
A-1082. SC2	13,070 ± 470
Small dung (<i>Ovis</i> (?) sp) 20 to 25cm in Grid AA.	
A-1132. SC3	13,770 ± 500
Large dung (<i>Oreamnos</i> (?) sp) 20 to 25cm in Grid GG.	
A-1165. SC4	2450 ± 80 $\delta^{13}C = -18.0\text{‰}$
Artiodactyl dung from strat 1, 5 to 10cm.	
A-1166. SC5	5760 ± 200 $\delta^{13}C = -14.1\text{‰}$
Artiodactyl dung from strat 1, 15 to 20cm.	
A-1154. SC6	10,760 ± 200 $\delta^{13}C = -18.2\text{‰}$
Artiodactyl dung pellets <0.25g each from strat 1, 20 to 25cm.	
A-1155. SC7	10,870 ± 200 $\delta^{13}C = -17.9\text{‰}$
Artiodactyl dung pellets <0.5g each from strat 1, 20 to 25cm.	
A-1167. SC8	12,980 ± 200 $\delta^{13}C = -20.2\text{‰}$
Artiodactyl dung from strat 1, 25 to 30cm.	
A-1168. SC9	15,500 ± 600 $\delta^{13}C = -21.7\text{‰}$
Artiodactyl dung from strat 1, 35 to 40cm.	
A-1246. SC10	17,030 ± 1070 $\delta^{13}C = -16.0\text{‰}$
Artiodactyl dung from strat 1, 55 to 60cm.	
A-1238. SC11	15,230 ± 240 $\delta^{13}C = -18.6\text{‰}$
<i>Teratornis</i> humerus (organic fraction) from unstratified woodrat midden. <i>Comment</i> : first direct date on this extinct bird.	
A-1056. SC12	>35,000
<i>Pseudotsuga menzeisii</i> (?) from base of unstratified deposits at Grid O-19, 65 to 90cm depth.	

A-1439. SC13 **>33,000**

Driftwood log Y, 35 to 60cm depth in O; P; Q-19. Coll 1969 by R C Euler; subm by C W Ferguson.

A-1443. SC14 **>33,000**

Driftwood, 37.5 to 40cm depth in wood test pit #1. Coll 1970 by C W Ferguson and Austin Long; subm by C W Ferguson.

General Comment: the cave, now dry, contains driftwood, under tree-ring study by C W Ferguson, overlain by goat dung (Iberall, 1972) with split twig figurines (Euler and Olsen, 1965) on the surface. Also see Euler (1978).

Rampart Cave dung series

Dung samples from Rampart Cave, Grand Canyon Natl Park, Mohave Co, Arizona (36° 06' N, 113° 56' W) along Colorado R at 535m elev. Coll 1969 and 1973 and subm by Austin Long and P S Martin. First reported in Long, Hansen, and Martin (1974) and Long and Martin (1974).

A-1041. Surface 0 to 5cm depth **11,480 ± 200**

Nothrotheriops shastense.

A-1042. 132cm depth **>40,000**

Nothrotheriops shastense.

A-1043. 99cm depth **36,200 ± 6000**

Nothrotheriops shastense.

A-1066. Surface 1 **11,000 ± 140**

Nothrotheriops shastense.

A-1067. Surface 2 **10,780 ± 200**

Nothrotheriops shastense.

A-1068. Surface 3 **11,020 ± 200**

Nothrotheriops shastense.

A-1070. 61cm depth **12,440 ± 300**

Nothrotheriops shastense.

A-1207. 67cm depth **13,140 ± 320**

Nothrotheriops shastense.

A-1208. 71cm depth **16,700 ± 900**

Nothrotheriops shastense.

A-1210. 99cm depth **32,560 ± 730**

Nothrotheriops shastense.

A-1278. 91cm depth **18,430 ± 300**

Oreamnos harringtoni.

A-1318. Unknown provenience **12,470 ± 170**

Nothrotheriops shastense.

A-1392. 0 to 3cm depth in Shutler's profile **11,370 ± 300**

Nothrotheriops shastense. *Comment:* sample carefully selected to exclude possible postglacial packrat detritus.

A-1602. Surface 4

11,090 ± 190
 $\delta^{13}C = -21.4\text{‰}$

Comment: coll and subm 1975 by M A Petit.

Muav Cave sloth dung series

Nothrotheriops shastense dung samples from Muav Cave, Grand Canyon Natl Park, Mohave Co, Arizona (36° 06' N, 113° 55' W) along Colorado R. Coll 1969 and 1973 and subm by Austin Long and P S Martin. First reported in Long, Hansen, and Martin (1974) and Long and Martin (1974).

A-1212. Surface **11,140 ± 160**

A-1213. Surface **11,290 ± 170**

Gypsum Cave series

Keratinous *Equus* hoof sections from cave in Clark Co, Nevada (36° 12' N, 114° 52' W). Coll ca 1930 by M R Harrington; subm by G T Jefferson and P S Martin.

A-1271. **25,000 ± 1300**

Large size hoof, species unknown. Loc 109, RS.

A-1449. **13,310 ± 210**

LACM(CIT) 109/41664, species unknown.

General Comment: samples are located in Los Angeles Co Mus Nat Hist. Sloth, horse, and camel remains from Gypsum Cave are well-preserved.

A-1448. Trampled *Nothrotheriops shastense* dung **23,700 ± 1000**

A-1202. Unknown provenience **11,360 ± 260**

A-1611. *Nothrotheriops shastense* dung **21,470 ± 760**

$\delta^{13}C = -18.8\text{‰}$

Comment: sampled from possibly unexcavated area of cave excavation proved that area was previously excavated.

Hanging Rock Cave series, Nevada

Dung resembling sloth dung from cave 21km E of Fallon, Churchill Co (39° 29' N, 118° 32' W). Coll 1940 by M S Wheeler; subm by P S Martin and T R Van Devender.

A-1329. Sample A **Modern**

A-1330. Sample B**Modern****Flaherty Shelter series, Nevada**

Fecal material of *Ovis canadensis* from Site #6-3-1 (36° 29' N, 115° 14' W) in Clark Co. Coll 1971 and subm by W G Spaulding, Dept Geosciences, Univ Arizona. *Comment:* pollen analysis by W G Spaulding indicates abundant *Ephedra*, *Cheno-Am*, and *Artemisia* growing at time samples were deposited. Upper level date implies time sheep abandoned area.

A-1297. 2.5 to 5cm depth, Level 2 **2400 ± 150**
 $\delta^{13}C = -22.9\text{‰}$

A-1298. 50 to 52.5cm depth, Level 20 **6950 ± 320**
 $\delta^{13}C = -20.8\text{‰}$

Guadalupe Mountain dung series, Texas

Fecal material found in caves in Culberson Co, Texas (31° 54' N, 104° 50' W) at 2000m elev. Coll 1974 by T R Van Devender and W G Spaulding; subm by P S Martin and T R Van Devender (unless otherwise noted).

A-1519. Dung *Nothrotheriops shastense* **11,590 ± 230**
 Id by P S Martin, from surface of unexcavated floor in Cave-05. Also coll by P F Van Cleave.

A-1533. Fecal pellets of *Cervus merriami* **11,760 ± 610**
 From Cave-08, 15cm below surface, just below charcoal layer.

A-1534. *Nothrotheriops shastense* dung **10,760 ± 150**
 From Cave-08, 15cm below surface.

A-1583. *Nothrotheriops shastense* dung **10,670 ± 140**
 $\delta^{13}C = -19.8\text{‰}$
 Sample 1a, Cave-08.

A-1584. *Nothrotheriops shastense* dung **11,020 ± 180**
 $\delta^{13}C = -22.8\text{‰}$
 Sample 3a, Cave-08.

A-1588. *Nothrotheriops shastense* dung **11,846 ± 167**
 $\delta^{13}C = -20.0\text{‰}$
 Sample 116 from Williams Cave.

A-1563. *Nothrotheriops shastense* dung **12,100 ± 200**
 Sample from Williams Cave at 1500m elev. *Comment:* portion of specimen on exhibit in public library in Carlsbad, New Mexico.
General Comment: see Guadalupe Mountain plant series, Texas.

A-1080. Trolinger Spring, Missouri **34,300 ± 1200**
 Organic filling material in tusk of *Mammuth americanum* from site in Hickory Co (38° 04' N, 93° 20' W). In addition to *Mammuth*, this site contains remains of *Symbos*, *Synaptomys*, and *Equus*. Sample contains

pine and sedge pollen indicating warmer conditions during mid-Wisconsin interstade than preceding or following glacial stadial climates. Coll 1968 by C V Haynes; subm by J E King, Dept Geosciences, Univ Arizona.

Gruta del Indio series, Argentina

Wood, dung, and charcoal (R, v 11, p 381-383) from cave in San Rafael, Argentina (30° 50' S, 68° 30' W). Coll 1969 to 1973 by H A Lagiglia and P S Martin; subm by P S Martin, Austin Long, and T R Van Devender.

A-1282. *Mylodon* dung **9650 ± 800**

From 70 to 80cm depth, Quad Q-7. *Comment:* sample represents latest occupation of sloth at this locality. Small sample size from loss in lab resulted in large counting standard deviation.

A-1351. *Mylodon* dung, 70 to 80cm depth **10,740 ± 150**

From Quad Q-7.

A-1371. *Mylodon* dung 80 to 90cm depth **11,350 ± 180**

From Quad Q-7.

A-1370. *Mylodon* dung, 70cm depth **24,730 ± 860**

From Quad R-8.

A-1372. Wood **>32,000**

Assoc with *Mylodon* remains at 1 to 1.1m depth, Quad RR-9.

A-1373. Charcoal **10,930 ± 540**

Assoc with *Mylodon* remains and dung, 2.2m depth, Quad F-3. *Comment:* this is deepest (oldest) charcoal level and implies human occupation time overlapping with *Mylodon*.

A-1636. *Mylodon* dung, 0 to 5cm **10,200 ± 300**
 $\delta^{13}C = -21.8\text{‰}$

A-1637. *Mylodon* dung, 0 to 5cm **9740 ± 280**
 $\delta^{13}C = -22.8\text{‰}$

A-1638. Charcoal from F-2 **10,530 ± 140**
 $\delta^{13}C = -23.1\text{‰}$

Senegal series

Dung samples of *Procapra welwitschi* found in crack in rocks near (17° 15' S, 12° 27' E). Coll 1973 by C G Coetzee; subm by N Robbins, USGS, Reston, Virginia.

A-1529. Dung (Sample A) **0 ± 50**

A-1530. Dung (Sample B) **145.3 ± 1.8‰ modern**

IV. PALEOBOTANICAL SAMPLES

A-1323. Diamond Creek, Arizona **Modern**

Driftwood from cave 15m above high water marks in creek bed near Grand Canyon (35° 44' N, 113° 22' W). Coll 1972 by P S Martin and

T R Van Devender; subm by P S Martin. *Comment*: date indicates either water was recently much higher than water marks indicate, or wood was emplaced artificially.

A-1441. Glendale, Nevada >**33,000**

Carbonized or burned wood from siltstone rich in snails, bone, and gypsum from Clark Co, Nevada (36° 39' N, 114° 35' W) at 549m elev, ca 6m below surface. Coll 1973 by T R Van Devender, Norman Tessman, and W G Spaulding; subm by T R Van Devender and P S Martin.

Hogup Spring series, Utah

Seeds from cores taken in spring-fed salt marsh sediments (41° 20' N, 113° 15' W) Box Elder Co. Pollen analysis by P J Mehringer, Jr indicates post-pluvial conditions existed when sediments were deposited. Coll 1968 and subm by P J Martin.

A-1037. *Scirpus* sp seeds 2500 ± 600

From 0.79 to 0.92m depth.

A-1121. *Scirpus* sp seeds 2200 ± 50

From ca 1m depth.

A-1135. *Scirpus* sp seeds 3490 ± 300
 $\delta^{13}C = -24.9\text{‰}$

From 2.15 to 2.25m depth. *Comment*: pretreatment consisted of NaOH/HCl leach cycles until no further color appeared in solution.

A-1035. *Scirpus* sp and *Ruppia maritima* seeds and charcoal 2580 ± 160

From 2.54 to 2.64m depth.

A-1170. *Scirpus* sp seeds 4350 ± 120

From 2.54 to 2.65m depth.

A-1140. Carbonate oolite >**40,000**
 $\delta^{13}C = +2.9\text{‰}$

From 4.32 to 4.44m depth.

General Comment: additional date on core is 26,700 ± 900 (I-4409, R, 1972, v 14, p 115) on oolite from 3.84 to 4.02m depth.

Curelom Cirque Core series, Utah

Organic material in mud from core in base of cirque in Raft River Mts (42° 55' N, 113° 21' W) Box Elder Co. Dates are tie points for pollen frequency variations analyzed by P J Mehringer, Jr. A volcanic ash appears at 4.725m depth. Coll 1969 and subm by P J Mehringer, Jr.

A-1139A. 4.2 to 4.3m NaOH insoluble fraction 5720 ± 120
 $\delta^{13}C = -21.8\text{‰}$

A-1139B. 4.2 to 4.3m NaOH soluble fraction 6800 ± 250
 $\delta^{13}C = -22.4\text{‰}$

A-1113A.	4.66 to 4.71m, NaOH soluble fraction	7270 ± 300 $\delta^{13}C = -22.2\%$
Sample from just above ash.		
A-1113B.	4.66 to 4.71m, NaOH soluble fraction	7260 ± 250 $\delta^{13}C = -22.5\%$
Sample from just above ash.		
A-1114.	4.76 to 4.81m, NaOH soluble fraction	7780 ± 100
Sample from just below ash.		
A-1110.	5.7 to 5.8m total organic matter	8800 ± 300
A-1111.	6.46 to 6.56m total organic matter	12,120 ± 1250
A-1162.	6.46 to 6.56m total organic matter	10,970 ± 200 $\delta^{13}C = -17.8\%$
Sample from adjacent but larger core.		
A-1112.	7.05 to 7.1m total organic matter	12,220 ± 830
Lowest zone containing organic matter in core.		

General Comment: organic matter content in samples was uniformly low. In one case (A-1139), NaOH soluble and insoluble fractions were analyzed separately, indicating some difference in ages. No reaction with HCl was observed in any sample. Sides of core samples were removed to eliminate possible core barrel contamination. Ash layer evidently is Mt Mazama.

A-962. Osgood Swamp, California **7340 ± 380**

Lodgepole pine cones from core from drained swamp (38° 46' N, 120° 03' W), Eldorado Co. Sample from sand layer 30cm below Mt Mazama ash and just above erosional surface on glacial laminated silts. Coll 1966 by D P Adam and G K Kelso; subm by D P Adam, USGS, Menlo Park, California. *Comment:* plant remains in sand layer indicate flora similar to present. Sand is apparently a mudflow or slopewash deposit.

Sonora Ironwood series, Mexico

Olneya tesota dead remnants near coast of Sonora coll to establish time when climate was favorable for growth. Coll 1969 and 1972 and subm by R R Humphrey, Dept Ecol & Evol Biol, Univ Arizona.

A-1071.	(29° 43' N, 112° 34' W)	210 ± 70
A-1327.	(29° 55' N, 112° 36' W)	550 ± 160

A-1000. Trolinger Spring, Missouri **29,340 ± 900**

Organic material in mud from spring deposit in N Hickory Co (38° 03' N, 93° 21' W). Coll 1968 by J E King; subm by P J Mehringer, Jr. *Comment:* from 1.6 to 1.7m below surface in pollen profile V, a tran-

sition from pine pollen to spruce pollen dominance occurs (Mehring *et al*, 1968).

4000 ± 330

A-1126. Estancia Basin, New Mexico

$\delta^{13}C = -29.2\text{‰}$

Plant remains enclosing bone fragment from sediments of ancient Lake Estancia (34° 44' N, 106° 04' W) Torrence Co, 1.09m below ground surface in Trench AA₃W. Coll 1969 and subm by T R Lyons, Dept Anthropol, Univ New Mexico, Albuquerque. *Comment*: sample assoc with mammoth bones and teeth, and should confirm time lake dried up (Lyons, 1970).

935 ± 95

A-1283. Tiburon Island, Mexico

$\delta^{13}C = -21.4\text{‰}$

Ironwood (*Olneya tesota*, id by C W Ferguson) remnant of stump from center of island (28° 29' N, 112° 25' W). Coll 1971 and subm by P S Martin. *Comment*: sample is one of many "old looking" stumps which may have potential for tree-ring paleoclimatic studies.

Modern

A-1232. Galapagos Islands

$\delta^{13}C = -16.4\text{‰}$

Scalesia (?) wood from SW coast of Isla Marchena (0° 18' N, 90° 31' W) apparently charred by most recent volcanic eruption. Coll 1970 by Tom Simkin; subm by B E Nordlie, Dept Geosciences, Univ Arizona. *Comment*: diameter of branches was 1 to 2cm, probably representing only a few seasons growth.

23,350 ± 1200

A-1289. Recreation Lake, Texas

$\delta^{13}C = -22.0\text{‰}$

Wood, probably chestnut from San Jacinto R near Houston (29° 57' N, 95° 07' W) in Harris Co. Sample is one piece of large quantity of driftwood excavated from 8m depth in coastal plain sediments near Gulf of Mexico. Coll 1972 by J F Newell; subm by C W Ferguson, Tree-Ring Lab, Univ Arizona.

10,130 ± 480

A-1250. Elves Chasm Rock Shelter, Arizona

$\delta^{13}C = -26.6\text{‰}$

Juniper wood from Elves Chasm Rock Shelter, Grand Canyon Natl Park, (36° 12' N, 112° 27' W) on left bank of Colorado R 187km downstream from Lee's Ferry. Coll 1971 by Austin Long and P S Martin; subm by Austin Long. *Comment*: juniper trees were growing here 50m above river at 700m elev at a time when a seep was active. This is supported by stratigraphic assoc of juniper wood with rock spirea. No plants are able to grow in shelter at present.

A-1191. Cuatro Cienagas

Modern

Stems and roots of six species of aquatic plants from Coahuila, Mexico (26° 59' N, 102° 94' W). Coll 1968 by D Gregor, J J Laudye, and W L Minckley; subm by E R Meyer, Dept Zool, Arizona State Univ, Tempe.

Howell's Ridge Cave series, New Mexico

Celtis reticulata endocarps from stratified cave deposit (31° 55' N, 108° 30' W) Grant Co. Coll 1972 by T R Van Devender and W G Spaulding; subm by P S Martin and T R Van Devender.

A-1354. 70 to 80cm deep 3470 ± 150

A-1429. 110 to 120cm deep, light unstained seeds 6820 ± 550

A-1430. 110 to 120cm deep, stained seeds 6410 ± 1270

General Comment: specimens of *Microtus*, *Gymnogyps*, and *Cryptotis* are assoc with these samples (see Van Devender and Worthington, 1977).

Crystal Springs, Ash Meadows series

Sample taken from Crystal Springs, Ash Meadows (36° 25' N, 116° 19' W) Nye Co, Nevada. Coll by D W Taylor 1970 and Austin Long 1971; subm by P J Mehringer, Jr and Austin Long.

A-1204. *Tryonia* sp shells 20,010 ± 630

Living snails coll from bottom ooze of spring outflow channel at ca 75m water depth. Snails could be assimilating ancient carbon in excess of those living in shallow marsh environment represented by most of fossil snails.

A-1253. Algae 15,030 ± 300

Completely submerged in spring. Coll to measure ¹⁴C in spring.

A-1254. *Ruppia* sp 6740 ± 240

Submerged in lake just below surface. Coll to measure exchange of CO₂ between spring water and atmosphere between spring and lake.

A-1257. Travertine 32,000 ± 4400

Sampled to evaluate possibility that lower travertine terraces were found in past or are presently forming.

Carson Slough, Ash Meadows series

Samples from Carson Slough, Ash Meadows (36° 29' N, 116° 21' W), Nye Co, Nevada. Coll 1968 to 1971 and subm by P J Mehringer, Jr.

A-998. *Scirpus* sp seeds 5310 ± 280

Date pollen profile at 90 to 95cm, (3.6g).

A-1064. *Scirpus* sp seeds 2940 ± 100

Date pollen profile at 90 to 100cm depth.

A-1069. *Scirpus* sp seeds 3640 ± 100

Date pollen profile at 144 to 148cm depth, (7.1g).

A-1163. Gastropod shells at 170 to 180cm depth **6290 ± 300**

Comment: Scirpus seed dates stratigraphically above A-1069 and below I-3766 (4740 ± 110 BP) serve as check on shell carbonate date. Shell carbonate dated older than bracketing seed dates.

A-1172. Scirpus sp seeds **3720 ± 200**

Date pollen profile and peat sec at 200 to 210cm depth, Hole 5 (3.1g).

A-1173. Scirpus sp seeds **3740 ± 100**

Date pollen profile and peat sec at 230 to 240cm depth, Hole 5 (17.3).

A-1174. Scirpus seeds **3980 ± 130**

Date pollen profile and peat sec at 257 to 267cm depth, Hole 5 (32.2cm).

A-1175. Scirpus seeds **4450 ± 110**

Sample from 290 to 300cm depth, Hole 5 (6.2g).

A-1176. Scirpus seeds **4810 ± 80**

Sample from 325 to 340cm depth, Hole 5 (22.2g).

A-1177. Scirpus seeds **5320 ± 70**

Sample from 355 to 365cm depth, Hole 5 (16.6g).

A-1178. Charcoal **3970 ± 120**

Dated dune sequence at 200 to 220cm depth, Hole (2.1g).

A-1203. Hydrobiidae shells **5020 ± 150**

Sample from 277 to 287cm depth, Hole 5 (2.8g).

A-1239. Fontelicella sp shells **6410 ± 270**

Sample from 175 to 182cm depth, Hole 8.

A-1269. Prosopis juliflora and P pubescens **4450 ± 360**

Charcoal at 215 to 225cm depth, Hole 2. *Comment:* establishes min age for presence of *Prosopis* in Amargosa Desert.

V. ARCHAEOLOGIC SAMPLES

A-808. Walker River, Nevada **1670 ± 280**

Charred plant remains in alluvium near Webber Dam ($39^{\circ} 02' N$, $118^{\circ} 52' W$) Mineral Co. Sample was 3m below top of 5m terrace and 2.5m below 5cm thick volcanic ash layer. Date should be max for ash layer. Coll 1966 by C V Haynes, P J Mehringer, Jr, and L Agenbroad; subm by C V Haynes.

Pantano series, Arizona

Charcoal samples from preceramic San Pedro Cochise site (ARIZ EE:2:50) ($31^{\circ} 59' N$, $110^{\circ} 35' W$) 5m below top of 6.2m terrace of

Pantano Wash, Cochise Co. Coll 1967 and subm by C V Haynes and E T Hemmings.

A-885. Sample No. 1. **1780 ± 100**
 $\delta^{13}C = -22.5\%$
Grave fill of Burial No. 2.

A-886. Sample No. 2. **1660 ± 60**
Rock-filled hearth in cultural stratum.

A-891. Horse Thief Draw, Arizona **900 ± 120**
Charcoal from Cochise type hearth ca 65m NW of falls near Lewis Spring Arroyo (31° 33' N, 110° 09' W) in Cochise Co. Sample was ca 1.3m below surface in alluvium. Coll 1967 and subm by C V Haynes.

A-916. Sambaqui de Carnica, Brazil **3300 ± 600**
Charcoal from SCLL13 CI (28° 32' S, 49° 12' W) in level 0 to 15cm below Stake X. Cultural level related to Sambaqui de Caierira. Coll 1966 by W R Hurt, Indiana Univ, Bloomington; subm by D C Grey.

A-929. Huachuca Mountains, Arizona **3820 ± 100**
 $\delta^{13}C = -23.7\%$
Charcoal from S fork of Ash Canyon (31° 22' N, 110° 16' W) in slumped organic mat overlying gravel fill containing probosidian tusk. Coll 1967 by E T Hemmings and C V Haynes; subm by C V Haynes.

A-999. Phillips Pits, Arizona **22,360 ± 500**
Apatite carbonate from *Mammuthus* humerus fragment in terrace gravels from Mus Northern Arizona locality 138 (35° 00' N, 110° 37' W), Navajo Co. Site is 5.5m below surface of first terrace above floodplain of Little Colorado R. Coll 1968 by M Jarrett; subm by J J Saunders, Dept Geosciences, Univ Arizona. *Comment:* apatite carbonate is still experimental and tends to give min ages.

Barnett site series, Nevada

Charcoal from site in Armagosa Valley, Nye Co (36° 25' N, 116° 20' W). Humbolt Base Concave type points in each buried pit assoc with charcoal. Site report in preparation by C N Warren, P J Mehringer, Jr, and Austin Long. Coll 1969 by C N Warren, P J Mehringer, Jr, and Austin Long; subm by Austin Long.

A-1008. From top of Burial No. 1, **1270 ± 380**
base of midden.

A-1015. From bottom of Burial No. 1 **1890 ± 110**

A-1020. Burial No. 2; G-9, 10; H-9, 10 **1990 ± 100**
At top sec of pit.

A-1021. Burial No. 2; H-9, 10; G-9, 10 **1780 ± 110**
At bottom sec of pit.

- A-1021R. Burial No. 2; H-9, 10; G-9, 10** **2040 ± 70**
At bottom sec of pit.
- A-1022. D-11** **2610 ± 90**
Located in undisturbed midden upper layer.
- A-1023. D-11** **1740 ± 120**
Located in undisturbed midden upper layer.
- A-1024. Hearth No. 1, G-11** **1990 ± 45**
- A-1025. Hearth No. 2, D-10, 11** **2040 ± 70**
- A-1048. Shell Sample #1** **16,910 ± 300**
Comment: upper 10cm consist of silty-sand containing gastropods located directly below midden.
General Comment: time of activity in site most likely 2100 BP to 1900 BP. Re-use ca 1250 BP is probable.
- A-1045. Murray Springs, Arizona** **10,760 ± 100**
Fraxinus sp charcoal (Sample H-7) from Site EE:8:25 (31° 34' N, 110° 10' W) hearth in SE ¼ of K18, Cochise Co, 3m below ground surface; assoc with bison remains and Clovis artifacts. Coll 1968 and subm by E T Hemmings. *Comment:* a stratigraphically correlated sample dated 11,230 ± 340 BP (A-805, R, 1967, v 9, p 11). *Comment* (ETH): date is slightly younger than expected and may indicate intrusion by overlying unit dated at 10,360 ± 90 (A-989B, R, 1971, v 13, p 11).
- A-1057. Grants, New Mexico** **Modern**
Charcoal from cinder pit near Bandera Crater (35° 00' N, 108° 04' W) Valencia Co. Sample assoc with stone axe at base of pit. Coll 1969 by A W Laughlin and J D Causey; subm by A W Laughlin.
- A-1072. Snaketown, Arizona** **1540 ± 70**
Mesquite charcoal from Crematorium 1:8E at ARIZ U:13:1 (33° 11' N, 111° 55' W), Maricopa Co. Assoc with Vahki Red bowl ceramics, 1.5m below surface. Coll 1964 by A E Johnson; subm by E W Hauray, Arizona State Mus, Univ Arizona. *Comment:* another log from same crematorium dated 1030 ± 120 BP (A-689, R, v 13, p 17).
- Boney Spring series, Missouri**
Organic matter from site in Benton Co (38° 06' N, 93° 22' W) containing evidence of human occupation and extinct mammal visitation (Mehring *et al*, 1968). Coll 1968 and subm by J E King, Illinois State Mus, Springfield.
- A-1076. Hickory nuts** **4200 ± 140**
1.1 to 1.2m below surface in peat layer which marks last major rise of Pomme de Terre R.

A-1079. Organic mud 13,550 ± 400

Sample from tusk cavity of *Mammot americanum* dominated by spruce pollen. *Comment*: consistent with 13,700 ± 600 date on another tusk filling from same deposit (M-2211, R, 1972, v 14, p 156).

A-1081. Ventana Cava, Arizona 8980 ± 300

Bone (assorted species) apatite, unbaked, from conglomerate layer, Pima Co (32° 20' N, 112° 14' W). Coll 1969 by J D Hayden, P E Damon, B Harrell, and Austin Long; subm by Austin Long. *Comment*: problematic artifacts of San Dieguito type were coll from this layer. Sample is stratigraphically below volcanic debris layer (A-203: 11,300 ± 1200 BP, R, 1962, v 4, p 246) and was analyzed on chance that "minimum" date would exceed 12,000 BP. Date is min, by nature of method and fraction analyzed.

Casamero series, New Mexico

Charcoal from Site No. LA8779 (35° 24' N, 108° 03' W), McKinley Co. Coll 1966 and subm by Ann Sigleo, Dept Geosciences, Univ Arizona.

A-1129. Burned roof beams 920 ± 100
 $\delta^{13}C = -22.3\%$

Sample from Room 5, Level 9, 137cm below present surface.

A-1130. Burned corn cobs 1170 ± 150
 $\delta^{13}C = -12.3\%$

Sample from Room 7, Level 6, W of doorway, 91cm below present surface. *Comment*: $\delta^{13}C$ correction makes age 1370 ± 150.

General Comment: assoc ceramics place site in Pueblo III period, AD 1050 to 1125.

A-1137. Barnett Dune site, Nevada 220 ± 100

Charcoal from site in Amargosa Valley, Nye Co (36° 24' N, 116° 24' W) containing artifactual evidence of Paiute occupation. Sample from block D-9, 20 to 30cm below datum. Coll 1970 by C N Warren; subm by P J Mehringer, Jr, Washington State Univ, Pullman.

Rio Rancho series, New Mexico

Charcoal samples assoc with human bones in alluvial sands and gravels in Sandoval Co (35° 15' N, 106° 15' W). Coll 1970 and 1971 by T Lyons and G Ratkovitch, Univ New Mexico; subm by Austin Long.

A-1138. 2.3m below datum near skull fragment Modern**A-1169. 1m below surface 0.1m 3510 ± 100**
NW of mandible
 $\delta^{13}C = -21.2\%$

General Comment: fluorine analysis on bone by Austin Long is consistent with near-modern age of bone.

Double Adobe series, Arizona

Samples of black organic matter and freshwater marl at site on Whitewater Draw (31° 30' N, 109° 45' W) in Cochise Co, containing mammoth remains as well as human artifacts (Sayles and Antevs, 1941). Unless otherwise noted, coll 1970 and subm by Austin Long.

A-1152. Organic nodules **10,420 ± 100**
 $\delta^{13}C = -28.8\text{‰}$

From Trench G in rusty sand 4m below surface, 5cm from distal end of femur. Coll by R Windmiller, Arizona State Mus, Univ Arizona.

A-1159. Organic nodules **9430 ± 130**
 $\delta^{13}C = -28.8\text{‰}$

Sample near pollen profile 25cm above bottom of N-S trench in rusty sand.

A-1160. Organic nodules **9110 ± 110**
 $\delta^{13}C = -26.2\text{‰}$

Sample near pollen profile 1m above bottom of N-S trench in rusty sand.

A-1158. Carbonate **10,690 ± 150**
 $\delta^{13}C = +0.4\text{‰}$

Sample at bottom of marl layer 3.2m below present surface.

A-1157. Carbonate **12,300 ± 250**
 $\delta^{13}C = -0.2\text{‰}$

Sample at top of marl layer 2.3m below present surface.

A-1156. Freshwater gastropod shells (*Physa* sp) **4650 ± 160**
 $\delta^{13}C = -7.4\text{‰}$

Sample 1.5m below surface 200m E of mammoth bone locality. Shells are in green clay 35 to 40cm above Cochise type manos, also in same green clay.

General Comment: Martin (1963) did pollen profile analysis for this site, and recollected for pollen when these samples were taken. Stratigraphy consists of basal pink caliche overlain by rusty sand containing mammoth bones and <1cm chunks of black organic matter. A marly gray clay overlies rusty sand at sampling site. Trenches and excavations extend to 4m below surface. Other dates from site include 8920 ± 1150 (TX-1199, unpub); 8240 ± 960 (A-184C, R, 1962, v 4, p 244); 7030 ± 260 (A-184E, R, 1962, v 4, p 244); 8270 ± 250 (A-188C, R, 1962, v 4, p 244); 8260 ± 160 (A-188E, R, 1962, v 4, p 244); 7560 ± 260 (A-192A, R, 1962, v 4, p 244); 4960 ± 300 (A-192B, R, 1962, v 4, p 244); 8960 ± 100 (A-189, R, 1963, v 5, p 293); 7910 ± 200 (A-190, R, 1963, v 5, 293); 8000 ± 60 (A-191, R, 1963, v 5, p 293).

A-1189. Fairchild site, Arizona **240 ± 80**

Charcoal from site ARIZ F:10:2 (32° 30' N, 110° 20' W) in Cochise Co. Sample from 20cm below surface, 1m N of Feat 18 (hearth). Coll

1971 and subm by R Windmiller. *Comment*: artifact styles indicate Cochise culture, probably transitional between Chiricahua and San Pedro stages. This date is not consistent with 1000 to 3000 BC expected age.

A-1190. Soza Wash, Arizona

Modern
 $\delta^{13}C = -4.0\text{‰}$

Apatite carbonate on human rib bones from skeleton at site BB:11:24 (32° 21' N, 110° 25' W) near San Pedro R in Cochise Co. Bones were eroding out of alluvial bank 2.4m below terrace surface. Coll 1971 and subm by H H Franklin and H Clements, Dept Anthropol, Univ Arizona. *Comment*: soil zone and stratigraphy in bank indicate layer containing bones may be at least several hundred years old. Bone apatite should give min age for bone. Results indicate that bone is either younger than overlying sediments, or apatite carbonate has exchanged more than previous indications (Haynes, 1968).

The Pas series

Charcoal samples from two sites (Carrot River and Pas Reserve) near the Pas, on Saskatchewan R, Manitoba. Coll 1967 to 1972 and subm by M Tamplin. Samples id to genus by Austin Long and confirmed by J H McAndrew, Royal Ontario Mus, Toronto. Series previously reported by Long and Tamplin (1977).

Carrot River site

A-1196. FIMh-1

490 ± 110

13.26g of *Picea* sp from Site FIMh-1 on S bank of Saskatchewan R. Site is located in unorganized territory on land owned by the Pas Indian band (53° 50' N, 101° 18' W) at ca 260m elev. Sample from Unit 4N/10W, Occupation Layer A, at 1.35m below surface, rear of hearth with assoc bone and Selkirk phase ceramics. Estimated age between AD 1700 and AD 1300 based upon ceramic typology.

The Pas Reserve site

Nine charcoal samples from FIMh-2 on N bank of Saskatchewan R opposite confluence of Pasquia R. Site is located in unorganized territory on main part of the Pas Indian Reserve (53° 51' N, 101° 16' W) at ca 260m elev. Samples coll within 10 × 14 × 1.5m excavation which was controlled by 2m grid system and fixed datum point. Finer spatial resolution was frequently possible and depth below datum could usually be taken to nearest centimeter. A-1183 to A-1324 coll 1968; A-1349 to A-1425 coll 1972.

A-1183. FIMh-2 Sample 1

280 ± 100

Populus sp charcoal (10g) from Unit 4N/4W on top of clay-silt layer above stratigraphic Unit (Layer Ia) ca 75cm below datum. Stratigraphic position and a few historic artifacts immediately above led to estimated date from AD 1400 to 1800.

A-1293. FIMh-2 Sample 2 **470 ± 60**

Charcoal (6.1g) from hearth in Unit 2N/6W (Layer Ia) ca 77cm below datum. Layer includes Selkirk phase occupation with fabric-impressed ceramic ware of Clearwater Lake type. Date was previously calculated at 525 ± 150 (see introduction in Long and Tamplin, 1977).

A-1294. FIMh-2 Sample 3 **1330 ± 100**

Charcoal (yielded 1.1L CO₂) from pit in Unit 6N/4W assigned to stratigraphic Unit 6 (Layers Ib-II) ca 80cm below datum or 1.3m below surface. Pit was excavated by Avonlea phase occupants of stratigraphic Unit 2 (Layer Ib) into lower occupations (Layer II), and contents were presumed to be mixed. However, on the expectation that some material might date from Layer Ib occupation, its age was estimated at 1200 to 1150 BP based on dates obtained for Avonlea phase Plains sites W of the Pas. Recalculated date is too late for Laurel phase in this area and may be too early for Avonlea (see introduction in Long and Tamplin, 1977).

A-1324. FIMh-2 Sample 4 **560 ± 45**

Betula sp charcoal (7.4g) from Unit 3 (Layer Ib) ca 85cm below datum. Stratum is extremely thin, almost ephemeral, Avonlea occupation, lying immediately below denser Selkirk layer. The single charcoal lump was run in 5L counter.

A-1349. FIMh-2 Sample 5 **980 ± 150**

Charcoal (4.3g) from pit in Unit 10N/10W assigned to Unit 3 (Layer Ia and b) ca 100cm below datum (see Long and Tamplin, 1977 for further discussion).

A-1368. FIMh-2 Sample 6 **1590 ± 50**

Charcoal (5.2m) from Unit 10N/2W SW ¼ assigned to stratigraphic Unit 4 (Layer II, top) 1.13m below datum. Sample was immediately overlain by fragmented but complete Laurel phase vessel. Previously calculated date was 1710 ± 100 (see introduction in Long and Tamplin, 1977).

A-1369. FIMh-2 Sample 7 **3190 ± 60**

Charcoal (5.9g) from pit in excavation Unit 2N/8W (3.5m N, 8.2m W) assigned to stratigraphic Unit 5 (Layer II), 1.14m below datum. Pit was in sterile gravel at base of lowest occupation of site, assigned to "Late Archaic" based on Duncan-Hanna projectile points recovered from layer. Date was previously calculated as 3310 ± 100 (see introduction in Long and Tamplin, 1977).

A-1424. FIMh-2 Sample 8 **1820 ± 150**

Charcoal (2g) assoc with hearth in excavation Unit 6N/6W assigned to stratigraphic Unit 4 (Layer II, top) 119cm below datum. Occupation was assigned to Laurel phase based on ceramic types. Sample was previously dated at 1760 ± 200 .

A-1425. FIMh-3 Sample 9 **23.3 ± 0.9‰ modern**

Charcoal (45g) from hearth in excavation Unit 6N/2W W_{1/2} assigned to stratigraphic Unit 4 (Layer II, top) ca 118cm below datum. Sample was hand-cleaned and pretreated at Trent Univ, and presumably became contaminated by very recent carbon in the process.

Maricopa County series, Arizona

Charcoal from site U:5:58 (Arizona State Univ) (32° 34' N, 110° 53' W) in Maricopa Co assoc with metate and mano of probable Colonial-Sedentary Hohokam. Coll 1970 and subm by K J Harris, Dept Anthropol, Univ Arizona.

A-1197. No. 23

20cm below surface.

1670 ± 100
 $\delta^{13}C = -22.8‰$

A-1198. No. 25

33cm below surface, 40cm S of A-1197.

1440 ± 100

Brockinton series, Manitoba

Charcoal sample from Brockinton site in SW Manitoba (49° 12' N, 101° 01' W) at alt 435m (previously reported by Long and Tamplin, 1977). Coll by E L Syms; subm by M Tamplin. *Comment*: assoc samples from Levels 3 and 5, Sq D, 27cm below surface. Estimated age of AD 1100 to 1600 was based on pottery typology.

A-1206a. Alkali insoluble fraction

Charcoal sample yielded 2.9L CO₂.

290 ± 120
 $\delta^{13}C = -24.9‰$

A-1206b. Humate fraction

Sample yielded 2.2L CO₂. *Comment*: lab contamination suspected when quartz CaO tube broke with sample in it.

1240 ± 70
 $\delta^{13}C = -24.7‰$

Roberts site series, Arizona

Charcoal from hearths at BB:13:59 (32° 05' N, 110° 56' W) in Cochise Co. Coll 1970 and subm by J E Ayres, Arizona State Mus, Univ Arizona. *Comment* (JEA): dates fall within expected range for Desert culture.

A-1214. Hearth No. 1

163m below surface.

1600 ± 70
 $\delta^{13}C = -23.2‰$

A-1215. Hearth No. 2

163m below surface.

2030 ± 180

General Comment: probably Cochise culture, although no other assoc cultural materials.

A-1270. Placitas site, New Mexico

Charcoal from alluvial site (35° 19' N, 106° 25' W) Sandoval Co. Assoc with "J" point artifact 15cm below surface. Coll 1971 and subm

120 ± 260

by T R Lyons, New Mexico Archaeol Center, Albuquerque. *Comment* (TRL): it is highly improbable that this artifact dates in historic period and appears that it was somehow introduced.

T-W-Diamond site series, Colorado

Charcoal from site in Larimer Co (40° 45' N, 105° 15' W) assoc with probably late prehistoric lithics and pottery. Coll 1971 and subm by E A Morris, Dept Sociol & Anthropol, Colorado State Univ, Fort Collins.

A-1272. No. 11

Feature 11, B₂₁, 15cm below surface.

1550 ± 340
 $\delta^{13}C = -21.7\text{‰}$

A-1273. No. 1

Feature 2, D₂, and F₂, 15cm below surface.

930 ± 230
 $\delta^{13}C = -23.0\text{‰}$

A-1274. No. 10

Feature 10, C₁₈, C₁₉, 15cm below surface.

780 ± 220
 $\delta^{13}C = -22.6\text{‰}$

A-1280. King Brown site, California

Elk antler from Maidu Indian site 4-SAC-29, Unit N2-W10 (38° 32' N, 121° 30' W) 168cm below surface in Sacramento Co, California. Coll 1967 by W Pritchard; subm by L D Arnold, Dept Geosciences, Univ Arizona. *Comment*: sample assoc with two Lanceolate blades (obsidian) typically of California Middle horizon (4000 to 1700 BP). Obsidian hydration measurements on blades yielded dates of 2351 ± 137 and 2285 ± 132 BP (Arnold, 1969).

950 ± 100
 $\delta^{13}C = -19.1\text{‰}$

A-1288. Chaco Canyon, New Mexico

Wood from Chetro Ketl (36° 04' N, 107° 57' W) Chaco Canyon Natl Monument, San Juan Co. Sample C2593 was single wooden object from cache of similar objects carved from single tree (*Pinus ponderosa*) found in Rm 93. Coll 1947 by R G Vivian; subm by T Mathews and J Young, Arizona Archaeol Center, Univ Arizona. *Comment*: wood was tentatively dendrochronologically dated by Bryant Bannister at AD 1050. In this time range, ¹⁴C dates based on Libby half-life (as present one is) and tree-ring dates agree very closely. Thus, analysis substantiates probable prehistoric origins of carved objects.

1080 ± 60
 $\delta^{13}C = -22.5\text{‰}$

Scorpion Ridge site series, Arizona

Charcoal from site V:9:14 (33° 25' N, 111° 15' W) in Gila Co, assoc with fire and broken rock and plainware sherds indicating probable Salado culture. Coll 1972 by R Windmiller; subm by J E Ayres, Arizona State Mus, Univ Arizona.

A-1343. Feature 1, plaza fire hearth

10cm below surface.

140 ± 120

A-1348. Hearth, Room 3 **790 ± 50**
 $\delta^{13}C = -25.3\%$
80cm below surface.

A-1317. Verde Valley, Arizona **Modern**
 $\delta^{13}C = -21.8\%$
Guano of *Tadarida* and *Myotis* sp 50cm below surface from cave in Yavapai Co. Coll 1972 and subm by M A Petit, Dept Microbiol, Colorado State Univ, Fort Collins. *Comment:* sample was from bottom of essentially unstratified guano deposit and was overlying Verde Brown potsherds probably made before AD 1125.

Salado site series, Arizona

Charcoal (probably juniper) from V:9:23 (33° 24' N, 111° 30' W) in Gila Co, consisting of single-room structure and containing plainware sherds indicating Salado culture. Coll 1972 by R Windmiller; subm by J E Ayres.

A-1344. No. 1 **350 ± 50**
 $\delta^{13}C = -23.3\%$
Sample from base of S wall of room, 10cm below surface.

A-1347. No. 8 **630 ± 50**
 $\delta^{13}C = -22.3\%$
Sample from base of wall, 10cm below surface.

Ta-e-wum site series, Arizona

Charcoal from V:9:13 (33° 23' N, 111° 30' W) in Gila Co, assoc with plain and smudged Santa Cruz phase Hohokam sherds, fire-broken rocks, metate and mano fragments. Coll 1971 by R Windmiller; subm by J E Ayres.

A-1345. Feature 1, Unit 10 **1020 ± 80**
 $\delta^{13}C = -22.3\%$
Base of pit into clay subsoil, 70cm below surface.

A-1346. Feature 5, Unit 11 **2290 ± 80**
 $\delta^{13}C = -21.2\%$
Pit into clay subsoil, 30cm below surface.

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