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UNIVERSITY OF TEXAS AT AUSTIN RADIOCARBON DATES X

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This list reports ^{14}C measurements completed between August 1971 and November 1973. Other projects completed in that period will be reported later. Age calculations are based on ^{14}C half-life of 5568 yr and modern standard of 95% NBS oxalic acid, supplemented by tree rings of pre-industrial wood from a log cut in the 1850's (Tx-540; R, 1970, v 12, p 249). Deviations reported are based on counting statistics of sample, background, and modern, and are $\pm 1\sigma$, except when sample count approaches either modern or background, 2σ limits are reported. Unless noted, $^{12}C/^{13}C$ measurements were not made and results are not corrected for ^{13}C fractionation. The laboratory uses liquid scintillation counting of benzene, with Li_2C_2 and vanadium-activated catalyst in preparation; chemical yields average 90%. Three counters are employed: a Packard Tri-Carb Model 3002, and 2 Beckman LS-230 spectrometers obtained through a grant from the National Science Foundation.

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I. GEOLOGIC SAMPLES

Texas

All samples subm by C V Haynes, Dept Geol Sci, Southern Methodist Univ, Dallas, Texas, and pretreated at SMU Radiocarbon Lab (see below, under *Arizona*).

Tx-1200. Seagoville, Texas **44,360 ± 3420** **42,410 BC**

Wood (5-45) from Gravel Pit B, 3.1 to 3.7m below surface of terrace, in gravel 0.6 to 0.9m below contact with overlying sand; 4km S of Seagoville, Texas (32° 36′ 05″ N, 96° 32′ 10″ W). Coll 1970 by E Williman.

Tx-889. Bois d'Arc Island, Texas **20,660 ± 350** **18,710 BC**

Wood fragments from sand-clay lens in gravel channel fill, ca 4.6m below flood plain, Bois D'Arc I gravel pit, SE Dallas Co, Texas (32° 35′ 10″ N, 96° 33′ 20″ W). Coll 1969 by Slaughter & Haynes.

Tx-890. Gifford Hill Gravel Pit, Texas **21,540 ± 3010 / 19,590 BC**

Wood and seed pods (*Ambrosia*) from clay lens in channel sand ca 3.7m from surface, NE wall of Gifford Hill No. 2 gravel pit, on Parsons Slough, SE Dallas Co, Texas (32° 33′ 50″ N, 96° 31′ 25″ W). Coll 1969 by Slaughter & Haynes.

Arizona

All samples in this section (and others in this list as noted) were subm by C V Haynes, Dept Geol Sci, Southern Methodist Univ, Dallas, Texas, and were pretreated at the SMU Radiocarbon Lab before combustion and counting facilities had been installed there.

All peat and soil samples were pretreated to separate insoluble organic residues from humic acids precipitated and analyzed as sodium humates (1st humate extraction). Some samples yielded 2nd and 3rd humate extractions upon retreatment with HCl and NaOH. Where multiple humate fractions were analyzed they were within 1σ of each other in each case.

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Murray Springs series, Arizona

The Murray Springs site (31° 34′ N, 110° 11′ W), 11.3km E of Sierra Vista, Cochise Co, Arizona (Ariz: EE:8:25) is a buried Clovis hunting camp and kill site where artifacts assoc with mammoth, bison, and horse occur within a sequence of late Quaternary sediments. Investigations supported by Natl Geog Soc (Archaeol) and Natl Sci Found (Geol). Coll 1966 through 1971 by C V Haynes.

Tx-1174. Bone apatite CO_2 4-3 **340 ± 370 / Modern**

Bone of early historic bison from N headcut at Pollen Profile 1, on contact between Units G_2 and H. *Comment* (CVH): seems less contaminated by nuclear age carbon than 5 previously dated fractions (A-819A through A-819E: R, 1971, v 13, p 5).

Tx-1196. Insoluble soil organic matter 14-54A **1340 ± 120 / AD 610**

Tx-1197. Humates 14-54B2 **1570 ± 80 / AD 380**

Gray soil on Unit E and buried by Unit H in S wall of Curry Draw opposite Pollen Profile 6. *Comment* (CVH): older age is probably minimum for soil development.

Tx-1046. Humates (2nd extraction) 4-28BB **8620 ± 160 / 6670 BC**

Organic clay of lower Unit F_3 at M24, Trench 12.

9100 ± 290

Tx-1173. Humates (1st extraction) 14-23B1 **7150 BC**

Organic clay from base of F_3 channel, N headcut, at intersection with Trench 22. *Comment* (CVH): date may be too old by $> 1\sigma$ due to redeposition from Unit F_2.

10,480 ± 200

Tx-1234. Marl carbonate 14-51 **8530 BC**

10cm sec (32V70) of Unit E marl, 10cm below top of exposure in E end of S wall of Trench 1.

13,310 ± 190

Tx-1235. Marl carbonate 14-52 **11,360 BC**

10cm sec (33V70) of Unit E marl, 50cm below top of exposure in E end of S wall of Trench 1.

Murray Springs Locality 1 series

5630 ± 130

Tx-936. Upper G_1 channel **3680 BC**

Humates from charcoal or decomposed wood in upper G_1 channel, E wall. *Comment* (CVH): date consistent with A-905A, 5750 ± 250 (R, 1971, v 13, p 34) from lower part of channel.

840 ± 60

Tx-937. Unit G_3 hearth **AD 1110**

Charcoal from non-ceramic rock hearth on Unit G_3 on present surface. An archaeomagnetic date is also to be determined for this hearth.

7920 ± 150

Tx-971. Unit F_3, caliche **5970 BC**

Hard carbonate particles in F_3 calcareous silt, 20cm above upper black mat, E wall. *Comment* (CVH): date is reasonable for time of secondary accumulation of $CaCO_3$.

8160 ± 130

Tx-972. Unit F_3, whole rock **6210 BC**

Same as Tx-971, but whole rock. *Comment* (CVH): in conjunction with Tx-971, date suggests secondary deposition of caliche nodules.

Murray Springs Unit F_1 series

12,600 ± 2440

Tx-1044. Charcoal 4-29A **10,650 BC**

Area 5 Clovis occupation surface, Sq K 18, 104cm W of L 18 line. *Comment* (CVH): sample very small but result is within 1σ of other dates from Clovis occupation.

10,260 ± 140

Tx-1045. Humates 4-29B **8310 BC**

Extracted from Tx-1044. *Comment* (CVH): probably contaminated with humates from overlying organic clay (F_2).

12,940 ± 390
Tx-1406. Charcoal 23-15 **10,990 BC**

Charcoal, F_1 channel sand, Area 1, Grid Point C3S.

11,080 ± 180
Tx-1413. Charcoal 23-17+18 **9130 BC**

Charcoal, F_1 channel sand, Area 1, Grid Point C5S.

10,710 ± 160
Tx-1459. Charcoal 23-26 **8760 BC**

Charcoal, F_1 channel sand, 5cm below F_2, N wall natural exposure, S Branch Curry Draw.

9790 ± 160
Tx-1460. Humates (1st extraction) 23-21b1 **7840 BC**

9850 ± 160
Tx-1461. Humates (2nd extraction) 23-21b2 **7900 BC**

Humates from charcoal in clay at top of Unit F_1, Trench 28, N branch, Curry Draw. *Comment* (CVH): obviously contaminated by younger humates. Charcoal too small to analyze.

10,930 ± 170
Tx-1462. Charcoal 23-19 **8980 BC**

From F_1 channel sand, Trench 28, N branch, Curry Draw.

10,900 ± 200
Tx-1463. Humates 23-19b1 **8950 BC**

Humates from Tx-1462.

Murray Springs Trench 18, Area 8 series

7430 ± 100
Tx-1178A. Insoluble organic matter **5480 BC**

7110 ± 140
Tx-1178B. Humates (1st extraction) **5180 BC**

6980 ± 180
Tx-1179. Humates (2nd extraction) **5030 BC**

Upper of 5 clay samples (20-16A1:1, 24A70) from Unit F_2, Trench 18, Area 8 between spring conduits 1 and 3. *Comment* (CVH): humate fractions appear to be too young by at least 1σ.

10,260 ± 430
Tx-1180. Insoluble organic matter **8310 BC**

9410 ± 160
Tx-1181. Humates (1st extraction) **7480 BC**

9240 ± 270
Tx-1182. Humates (2nd extraction) **7290 BC**

Lowest of 5 clay samples (20-20A, 28A70) in Unit F_2, Trench 18, Area 8 between spring conduits 1 and 3. *Comment* (CVH): humate fractions appear to be too young by as much as 2σ.

Murray Springs Trench 13 N series

		9810 ± 570
Tx-1183.	**Insoluble organic matter**	**7860 BC**
		9570 ± 370
Tx-1184.	**Humates (1st extraction)**	**7620 BC**
		9980 ± 360
Tx-1185.	**Humates (2nd extraction)**	**8030 BC**

Lowest of 4 black organic clay layers (20-36A, 44A70) in F_2 at Trench 13 N. *Comment* (CVH): agreement of all 3 fractions suggests correct age, but with respect to rest of series it appears too young by as much as 2σ.

		9660 ± 150
Tx-1237.	**Marl carbonate 20-38**	**7710 BC**

Middle of 3 samples (46A70) from lowest of 4 layers of F_2 marl, Trench 13 N.

		9810 ± 150
Tx-1238.	**Marl carbonate 20-39**	**7860 BC**

Upper of 3 samples (47A70) from lowest of 4 layers of F_2 marl, Trench 13 N.

		9310 ± 150
Tx-1239.	**Marl cabonate 20-41**	**7360 BC**

Lower intermediate marl (49A70) in F_2, Trench 13 N. *Comment on Tx-1237-1239* (CVH): marl carbonate dates show good internal consistency with stratigraphic age.

		10,480 ± 960
Tx-1252.	**Insoluble organic matter 20-40A**	**8530 BC**
		9560 ± 150
Tx-1253.	**Humates (1st extraction) 20-40B1**	**7610 BC**

Lower intermediate black clay (48A70) in F_2, Trench 13 N. *Comment* (CVH): humate date is probably correct within 2σ.

		5050 ± 2030
Tx-1247.	**Insoluble organic matter 20-42A**	**3100 BC**
		9820 ± 160
Tx-1248.	**Humates 20-42B**	**7870 BC**

Upper intermediate black clay (50A70) in F_2, Trench 13 N. *Comment* (CVH): insoluble organic fraction was too small.

		10,200 ± 680
Tx-1241.	**Insoluble organic matter 20-43A**	**8250 BC**
		8600 ± 240
Tx-1242.	**Humates (1st & 2nd extractions) 20-43B2**	**6650 BC**
		8940 ± 210
Tx-1243.	**Humates (3rd extaction) 20-43B3**	**6990 BC**

Tx-1240. Marl carbonate 20-43C **9240 ± 140 / 7290 BC**

Upper intermediate marl (51A70) in F_2, Trench 13 N. *Comment* (CVH): humate fractions seem to agree better with marl carbonate.

Tx-1186. Insoluble organic matter 20-44A **10,580 ± 3500 / 8630 BC**

Tx-1187. Humates (1st extraction) 20-44B1 **8870 ± 140 / 6920 BC**

Tx-1188. Humates (2nd extraction) 20-44B2 **8580 ± 240 / 6630 BC**

Highest of 4 black organic clay layers (52A70) in F_2 at Trench 13 N. *Comment* (CVH): considering rest of series and standard deviations, humate fractions are probably closest to correct age.

Tx-1245. Insoluble organic matter 20-45A **10,800 ± 1700 / 8850 BC**

Tx-1246. Humates 20-45B **8820 ± 250 / 6870 BC**

Tx-1244. Marl carbonate 20-45C **8980 ± 140 / 7030 BC**

Highest of 4 marls in F_2, Trench 13 N. *Comment* (CVH): humate fraction agrees best with carbonate fraction.

Tx-1189. Insoluble organic matter 20-47A **9640 ± 180 / 7690 BC**

Tx-1190. Humates (1st extraction) 20-47B1 **9630 ± 310 / 7680 BC**

Tx-1191. Humates (2nd extraction) 20-47B2 **9450 ± 180 / 7500 BC**

Lowest of 3 clay samples (55A70) in Unit F_3 channel at Trench 13 N. *Comment* (CVH): agreement of these 3 values indicates F_3 channel was cut and Unit F_2 was redeposited after this time.

Tx-1249. Insoluble organic matter 20-49A **7410 ± 610 / 5460 BC**

Tx-1250. Humates (1st extraction) 20-49B1 **9320 ± 200 / 7870 BC**

Tx-1251. Humates (2nd extraction) 20-49B2 **9020 ± 190 / 7070 BC**

Intermediate of 3 clay samples (57A70) in F_3 channel at Trench 13 N. *Comment* (CVH): humate dates are consistent with F_3 channel fill being redeposited from Unit F_2. Insoluble organic matter date may be correct within 1σ.

9200 ± 440

Tx-1192. Insoluble organic matter 20-50A **7250 BC**

8090 ± 130

Tx-1193. Humates (1st extraction) 20-50B1 **6140 BC**

Upper of 3 clay samples (58A70) in F_3 channel at Trench 13 N. *Comment* (CVH): older value probably contains redeposited F_2, and younger one may contain younger humates but is probably closer to true age.

Grass Circle Trench series, Arizona

Circular depression (31° 33′ 40″ N, 110° 10′ 05″ W) on pediment surface 1.4km S of Murray Springs, Cochise Co, Arizona, contains sediments and compound soils and supports 17ha of desert grassland within an area of Chihuahuan desert shrub. Coll 1968 by C V Haynes.

1890 ± 130

Tx-1176. Insoluble soil organic matter 13-3A **AD 60**

Upper sample from black soil, 0.3m below surface at 20+00E.

3020 ± 90

Tx-1177. Humates (1st extraction) 13-3B1 **1070 BC**

Humates from Tx-1176.

4340 ± 140

Tx-1175. Insoluble soil organic matter 13-2A **2390 BC**

Lower sample from black soil, 0.6m below surface at 20+00E.

Location 63a series, Arizona

Humates from relict B-horizon at location 63a (79H69), 0.4km N of mouth of Horsethief Draw, 12.9km E of Sierra Vista, Cochise Co, Arizona (31° 33′ N, 110° 08′ W). Coll 1969 by C V Haynes.

530 ± 190

Tx-1232. Humates 14-29B1 & 2 **AD 1420**

12.2m strath terrace.

680 ± 240

Tx-1233. Humates 14-30B1 **AD 1270**

18.3m strath terrace.

Graveyard Gulch series, Arizona

Cochise hearths exposed in walls of Graveyard Gulch, 16km NE of Sierra Vista, Arizona (31° 38′ N, 110° 11′ W). Coll 1968 by C V Haynes.

4810 ± 90

Tx-1038. Hearth #1, 3-13 **2860 BC**

Charcoal from hearth, ca 5.5m below top of 8m terrace and in lower part of red silt of Unit G_1.

Tx-1048. Hearth #2, 13-15 **5790 ± 360 / 3840 BC**

Charcoal from Cochise hearth below erosional contact truncating soil in red fill of Unit G_1.

Tx-1049. Hearth #3, 13-16 **4020 ± 80 / 2070 BC**

Charcoal from hearth above contact truncating soil in red fill.

Lindsey Ranch series, Arizona

Samples from Lindsey Ranch, Cochise Co, Arizona (31° 38′ 10″ N, 110° 09′ W). Coll 1968 by C V Haynes.

Tx-970. Marl carbonate **7990 ± 130 / 6040 BC**

Marl from below black organic mat, on surface. *Comment* (CVH): date younger than expected, probably because of contamination by exchange.

Tx-934. Organic residue **9420 ± 470 / 7470 BC**

Black organic mat from surface outcrop; black mat (F_2?) occurs above marl (E?) and below tan silt (G_1?). *Comment* (CVH): age probably minimum because of unknown content of rootlet contamination too small to be removed.

Tx-935. Humates **7060 ± 310 / 5110 BC**

Humates from black organic mat (see Tx-934). *Comment* (CVH): value indicates significant contamination by younger humates.

Cerros Negros marl series

Samples of marl from Cerros Negros site, 6.4km SE of San Manuel, Arizona (32° 32′ N, 110° 33′ W). Coll 1968 by N M Johnson and C V Haynes. Samples listed in stratigraphic order from top to bottom of sec.

Tx-976. Marl carbonate, 98H69 **13,630 ± 200 / 11,680 BC**

Tx-977. Marl carbonate, 97H69 **12,190 ± 210 / 10,240 BC**

Tx-975. Marl carbonate, 94H69 **16,160 ± 210 / 14,210 BC**

Tx-979. Marl carbonate, 89H69 **21,190 ± 520 / 19,240 BC**

Tx-978. Marl carbonate, 86H69 **26,180 ± 960 / 24,230 BC**

27,410 ± 1120

Tx-974. Marl carbonate, 79H69 **25,460 BC**

Very pale brown (white) clayey marl near base of sec and below erosional (?) break.

27,060 ± 1080

Tx-973. Marl carbonate, 76H69 **25,110 BC**

Basal portion of sec.

General Comment (CVH): considering σ values and possible contamination by exchanged CO_2, the series is reasonably consistent.

10,750 ± 170

Tx-1236. Curry Draw, 35V70 **8800 BC**

Marl carbonate (14-53) from 1m below top of Unit E marl in headcut of S tributary of Curry Draw between Murray homesite and Tombstone aqueduct, Cochise Co, Arizona (31° 34′ 37″ N, 110° 09′ 56″ W). Coll 1970 by C V Haynes.

2550 ± 80

Tx-933. Horsethief Draw **600 BC**

Charcoal from middle of G_{2b}, Horsethief Draw alluvial fan, Cochise Co, Arizona (31° 32′ 30″ N, 110° 8′ 45″ W). Coll 1969 by C V Haynes. *Comment* (CVH): confirms San Pedro age of hearth and correlation to Unit G_{2b} at Murray Springs.

1670 ± 80

Tx-938. Schaldack Site Rock Hearth **AD 271**

Charcoal from rock hearth on surface at Schaldack site, Cochise Co, Arizona (31° 35′ 42″ N, 110° 11′ 20″ W). Should date late San Pedro occupation. Coll 1968 by C V Haynes. *Comment* (CVH): date suggests that late San Pedro phase persisted into ceramic period but remained non-ceramic.

1730 ± 140

Tx-939. Dubois Hearth **AD 220**

Charcoal from hearth on surface S of Schaldack site, Arizona (31° 35′ 30″ N, 110° 11′ 20″ W). Archeomagnetic dating of sample from this hearth is planned. Coll 1968 by C V Haynes. *Comment* (CVH): same as with Tx-938 (above), with which date agrees.

2780 ± 80

Tx-1037. Moson Wash, S Tributary, 3-4 **830 BC**

Hearth charcoal from ca 13km NE of Sierra Vista, Arizona (31° 35′ 43″ N, 110° 10′ 40″ W), 1m below top of 4m terrace, G2a/G2b(?) contact; Cochise style hearth.

1420 ± 120

Tx-1039. Aqueduct locality, 3-14. **AD 530**

Charcoal from ceramic period hearth from Unit G2b2, at Aqueduct loc, Arizona (31° 34′ 14″ N, 110° 9′ 10″ W).

Tx-1040. East Side Arroyo, 3-15 **3580 ± 90** **1630 BC**

Hearth charcoal from ca 1.2km S of Arizona Hwy 90 and 0.8km W of E boundary of San Rafael Grant, Arizona (31° 32′ 35″ N, 110° 7′ 15″ W), in banded reddish-brown and gray alluvium of Unit G_{2a}, 1.8m below top of 3m terrace.

Tx-1041. Schaldack Wash, 3-16 **1090 ± 70** **AD 860**

Hearth charcoal from ca 9.5km NE of Sierra Vista, Arizona, on surface between Schaldack site and Woodcutter Draw (31° 35′ 40″ N, 110° 11′ 55″ W).

Tx-1042. Schaldack Wash, 3-17 **3380 ± 350** **1430 BC**

Charcoal from surface hearth, same site as Tx-1041, base of reddish-brown clayey silt (G_{2a}?).

Tx-1043. Boquillas North Arroyo, 3-21 **2860 ± 80** **910 BC**

Hearth charcoal from N bank of deep arroyo ca 1.6km NW of old Boquillas rr sta, Arizona (31° 47′ N, 110° 14′ W), 1.8m below top of 4m terrace of Unit G_2.

Tx-1047. Lehner Ranch 5-18B **3770 ± 60** **1820 BC**

Humates from red soil at top of Unit G_2, Trench B, Lehner Ranch, ca 6.5km NNE of Palominas, Arizona (31° 25′ 23″ N, 110° 06′ 48″ W).

Tx-1194. Southern Pacific RR Sec 1048 **2050 ± 90** **100 BC**

Charcoal (13-28) from occupation surface with human burial 0.9m below top of 3m terrace, 0.8km E of abandoned rr sta of Boquillas and 20.9km S of Benson, Cochise Co, Arizona (31° 47′ N, 110° 13′ W). Coll 1970 by S Haney.

Tx-1198. Millville Relict Paleosol, Loc 59 **1590 ± 180** **AD 360**

Humates (14-24B1), from B horizon of 0.3m red soil in roadcut on S side of Charleston rd, opposite ruins of Millville, Cochise Co, Arizona (31° 37′ N, 110° 09′ W). Coll 1969 by C V Haynes. *Comment* (CVH): residue contained no carbon. Humates probably derive from overlying soils.

Tx-1199. Double Adobe **8920 ± 1150** **6970 BC**

Charcoal (15-43A) from fine gravel, coarse sand alluvium (Unit b) containing rolled mammoth bones. Ca 400m S of Double Adobe store, in W bank of Whitewater Draw, Arizona (31° 28′ N, 109° 42′ W). Coll 1970 by C V Haynes.

Snaketown series, Arizona

Samples from Snaketown site on Gila R CW of Chandler, Arizona (33° 10′ 45″ N, 111° 55′ 22″ W).

Tx-888. Snaketown St-9, flood plain **530 ± 80** **AD 1420**

Charcoal, 7.82m below datum (65cm below surface), 26m from S end of Flood-plain Trench 1; at contact between loose, weakly laminated sand below and grayish-tan silty clay above. Dated for comparison of flood-plain deposition to age of occupation. Coll 1965 by C V Haynes.

Tx-891. Snaketown canal **1580 ± 60** **AD 370**

Tufa ($CaCO_3$) from lining of Hohokam irrigation canal (Trench I) and coating pottery of types dating AD 1350 to 1400; between Units X and Y. Dated to determine apparent age and ^{14}C deficiency, if any. Sample was split and 2 parts prepared and counted separately: 1650 ± 80, 1510 ± 90. Average $\delta^{14}C = -178.3 \pm 4.2‰$. Coll 1969 by E W Haury. *Comment* (CVH): data suggest that there is a "fossil" component in water which could have been derived from springs.

New Mexico

All samples in this section were subm by C V Haynes and pretreated at Southern Methodist Univ Radiocarbon Lab as described above under *Arizona.*

Capulin Mountain Flow series, New Mexico

Burnt paleosol from S bank of Dry Cimarron R (CS-70-17), under basalt flow from Capulin Mt, 1.61km W of Folsom, Union Co., New Mexico (36° 51′ N, 104° 56′ W). Coll 1970 by C V Haynes.

Tx-1268. Insoluble soil residue 17-12A **22,360 ± 1160** **20,410 BC**

Tx-1269. Soil humates 17-12B2 **13,860 ± 2170** **11,910 BC**

Comment (CVH): residue date should be minimum for soil, provided there was no contamination from volcanic CO_2.

Folsom Site series, New Mexico

Materials recovered from area of Folsom site arroyo (FEP70-6) near Folsom, New Mexico (36° 53′ N, 104° 04′ W). Coll 1970 & 1971 by Adrienne Anderson, Natl Park Service, and C V Haynes.

Tx-1270. Charcoal 17-10 **4850 ± 120** **2900 BC**

Charcoal sample (CS-70-14) from red burnt layer in Unit Qyla, ca 0.4km downstream from Folsom type site, 12.9km WNW of Folsom.

Tx-1271. Charcoal 17-11 **6910 ± 110**
4960 BC

Charcoal (CS-70-16) from buried fire pit near top of Unit Qy, ca 0.4km S of Folsom type site on main draw.

Tx-1272. Wood and charcoal 17-8 **4470 ± 90**
2520 BC

Charred wood and charcoal sample (CS-70-13) from upper Unit Qyla, ca 0.4km downstream from Folsom type site and 12.9km WNW of Folsom.

Tx-1452. Charcoal 17-9 **6060 ± 500**
4110 BC

Charcoal sample from base of Qo2, upstream from Folsom type site, 11.3km NW of Folsom.

California, Wyoming

Tx-1195. Little Lake Borrow Pit, 3C70, California **1420 ± 70**
AD 530

Charcoal (19-46) from hearth lens 1.5m below surface of 2.1m terrace within alluvial fan, ca 400m NW of Little Lake Hotel, Little Lake, California (35° 50′ N, 117° 50′ W). Coll 1970 and subm by C V Haynes, and pretreated at Southern Methodist Univ Radiocarbon Lab.

Hell Gap series, Wyoming

Charcoal from Hell Gap site, 19.3km N of Guernsey, Wyoming (42° 25′ N, 104° 38′ W). Coll 1966 and subm by C V Haynes, and pretreated at Southern Methodist Univ Radiocarbon Lab.

Tx-1464. Hell Gap 5-2 **290 ± 80**
AD 1660

Upper of two bands in loose brown silt and gravel, bands 0.3m apart in arroyo wall by gas tank.

Tx-1465. Hell Gap 5-3 **300 ± 90**
AD 1650

Hearth, 10.2 to 15.2cm below top of 1.5m terrace and just under grass roots, S of Loc II.

Missouri

All samples subm by C V Haynes and pretreated at Southern Methodist Univ Radiocarbon Lab as described above under *Arizona.*

Boney Springs series, Missouri

Samples from Boney Springs site (23BE146), 4km NW of Avery and 18.1km N of Wheatland, Benton Co, Missouri (38° 06′ 20″ N, 93° 22′ 10″ W). Coll 1971 by R B McMillan and C V Haynes.

Tx-1407. Peat humates 22-6B **28,330 ± 3140**
26,380 BC

Humates from top of brown pebbly peat, Trench A, Pollen Profile I, between pollen samples +2 and +3.

22,730 ± 590
Tx-1408. Plant fragments 22-6c **20,780 BC**
From same location as Tx-1407.

26,440 ± 1170
Tx-1409. Plant fragments 22-7c **24,490 BC**
From base of brown pebbly peat, Trench A, Pollen Profile I, between pollen samples 0 and −2.

21,380 ± 500
Tx-1410. Wood 22-5 **19,430 BC**
Wood fragments from upper third of olive organic clay, Trench A, 1.3m W of Pollen Profile I.

7290 ± 1900
Tx-1466. Charcoal 22-1,2,3,4 **5340 BC**
Dispersed charcoal from blue clay matrix on bone bed near center of spring.

24,460 ± 10,000
Tx-1467. Peat 22-9AB2 **22,510 BC**
Organic residue and humates from base of lowest peat in Trench A.

27,480 ± 1950
Tx-1468. Humates 22-9B1 **25,530 BC**
From base of lowest peat in Trench A.

Tx-1469. Wood 22-24 $\delta^{14}C = +7.50 \pm 5.3‰$
From middle of very dark brown peat, 1.75m below datum.

1910 ± 80
Tx-1470. Humates 22-25b1 **AD 40**
From charcoal, middle of very dark brown-gray organic clay.

1900 ± 80
Tx-1471. Wood 22-26 **AD 50**
Wood from middle of very dark brown-gray organic clay in 480 NW 515.

1920 ± 50
Tx-1472. Wood 22-28 **AD 30**
Wood from pit in middle of very dark brown-gray organic clay in 480 NW 515.

28,230 ± 940
Tx-1473. Tufa carbonate 22-30c **26,280 BC**
Tufa from base of feeder just under bone bed in center of spring.

16,190 ± 400
Tx-1629. Moss 22-30a **14,240 BC**
Moss encased in pseudomorphic tufa jackets of Tx-1473.

Tx-1474. Wood 22-8 **20,300 ± 470**
18,350 BC

Wood from peat at top of olive organic clay in Trench A between pollen samples +9 and +10.

Tx-1475. Humates 22-8b1 **17,320 ± 1810**
15,370 BC

Humates from peat at top of olive organic clay in Trench A between pollen samples +9 and +10.

Tx-1476. Humates 22-862 **19,550 ± 1080**
17,600 BC

Humates from peat (2nd extraction), sample in Tx-1475.

Tx-1477. Wood 22-31 **16,490 ± 290**
14,540 BC

Picea wood from granular tufa in spring feeder below bone bed.

Tx-1478. Wood 22-32 **16,540 ± 170**
14,590 BC

Wood from feeder wall under bone bed.

Tx-1479. Wood 22-33 **20,710 ± 530**
18,760 BC

Wood (*Salix* or *Populus*) from base of olive gray clay of lower peat at base of spring feeder.

Koch Spring series, Missouri

Samples from Koch Spring site, 3.2km SE of Avery and 13.3km NNE of Wheatland, Hickory Co, Missouri (38° 03′ N, 93° 20′ W). Coll 1971 by C V Haynes.

Tx-1411. Wood 22-10 **620 ± 80**
AD 1330

Wood fragments from Trench V-5, top of black, clayey peat.

Tx-1412. Plant fragments 22-15 **31,880 ± 1340**
29,930 BC

Plant fragments from middle of brown pebbly clayey peat Trench V-1N, Pollen Profile V #10.

Tx-1453. Wood 22-11 **640 ± 60**
AD1310

Wood recovered from base of peat in Trench V-5.

Tx-1454. Wood 22-12 **840 ± 60**
AD 1110

Wood recovered from gray organic clay below peat in Trench V-5.

Tx-1455. Humates 22-16B **30,880 ± 1320**
28,930 BC

Humates from brown pebbly clayey peat, between samples 12 and 13, Trench 1 N, Pollen Profile V.

Tx-1456. Wood 22-17 $\delta^{14}C = +43.88 \pm 5.7‰$

Wood from bottom 20cm of middle of dark brown clayey peat in Trench V-5, Pollen Profile VII.

Tx-1457. Wood 22-18 **>38,000**

Wood recovered from peat, from middle of grayish brown organic clay in Trench 1 N, Pollen Profile V.

Tx-1458. Wood 22-18B **33,550 ± 3210**
31,600 BC

Humates from peat in Tx-1457.

Jones Bog series, Missouri

Samples from Jones Bog, 1.6km ESE of Avery School, Missouri (38° 03′ 25″ N, 93° 20′ 22″ W). Coll 1971 by C V Haynes.

Tx-1626. Humate (2nd extraction) 22-22b2 **39,020 ± 2600**
37,070 BC

From base of peat exposed in W extension of backhoe trench through pond.

Tx-1627. Humates & plant fragments, 22-21ab1 **>40,000**

From top of peat exposed by backhoe.

Tx-1628. Wood fragments, 22-23a **>40,000**

From olive gray sands below peat exposed by backhoe.

General Comment (CVH): entire peat layer is probably beyond range of radiocarbon dating.

II. OCEANOGRAPHIC SAMPLES

Texas

Oolite Coating Series II, S Texas coast

Samples of 2ϕ oolite (sand grains coated with concentric $CaCO_3$ coatings) from present beach sand in swash zone, shore of Azalan Bay, 3.3km NE of mouth of Cayo del Infiernillo, Laguna Madre, S Texas coast (27° 20′ 30″ N, 97° 32′ 15″ W). Dated in continuing study of time and rate of oolitic coatings. Present samples have different mineralogy and crystal orientation from those previously examined (R, 1970, v 12, p 619-620).

Oolitic coatings were removed by first calculating volume of 3N HCl necessary to dissolve desired weight of $CaCO_3$ from previously weighed sand sample. In Tx-1076 coatings were stripped serially. For complete statement of technique see Frishman (1969).

Samples coll 1969 by Frishman and Behrens; subm by E W Behrens, Univ Texas Marine Sci Inst, Port Aransas, Texas.

Tx-1075. 2AB(2)TOT$_1$ **Modern**
$\delta^{14}C = +1.2 \pm 6.6‰$ $\%$ *modern* $= 100.2 \pm .66$

35g $CaCO_3$ (most of coatings) dissolved from 95.6 total oolite by 233ml 3N HCl. *Comment* (EWB): modern age results fortuitously from mixture of positive bomb-created carbon and negative older carbon.

Tx-1077. 2AB(2)TOT$_2$ **500 ± 60**
AD 1450
$\delta^{14}C = -59.9 \pm 5.6‰$ $\%$ *modern* $= 94.00 \pm .56$

50g oolite dissolved in excess of 3N HCl. *Comment* (EWB): greater apparent age than Tx-1075, because sample includes even older material dissolved in excess acid.

Tx-1076A. 2AB(2)a: 1st fraction **Modern**
$\delta^{14}C = +95.6 \pm 7.1‰$ $\%$ *modern* $= 109.56 \pm .71$

Outer oolitic coatings. Total oolite in Tx-1076 = 382.5g.

Tx-1076B. 2AB(2)b: 2nd fraction **190 ± 60**
AD 1760
$\delta^{14}C = -23.0 \pm 5.7‰$ $\%$ *modern* $= 97.70 \pm .57$

Tx-1076C. 2AB(2)c: 3rd fraction **600 ± 70**
AD 1350
$\delta^{14}C = -71.4 \pm 5.5‰$ $\%$ *modern* $= 92.86 \pm .55$

Tx-1076D. 2AB(2)d: 4th fraction **730 ± 70**
AD 1220
$\delta^{14}C = -86.6 \pm 5.4‰$ $\%$ *modern* $= 91.34 \pm .54$

Inner oolitic coatings.

General Comment (EWB): dates very similar to, and confirm data from earlier series, showing that: 1) oolitic sands at this site, like previous site, formed in 1000 yr; 2) formation was sporadic; 3) formation was very active during past 15 yr, since nuclear weapons testing caused high positive ^{14}C anomalies in environment. Present samples also show that oolites of different mineralogies (one predominantly aragonite and one predominantly Mg-calcite) formed during same period, and that one type of oolite apparently does not form by alteration of the other.

Jamaica

Reef Crest series, Jamaica

Samples of coral aragonite ($CaCO_3$) from reef crest, midway between Discovery Bay Marine Lab and Kaiser Ship Channel, Discovery Bay, Jamaica (18° 27′ 12″ N, 77° 24′ 0″ W). Coll 1970 and subm by L S Land, Dept Geol Sci, Univ Texas, Austin. Depths are below sea level.

Tx-1168. Reef Crest, Hole 1 **5300 ± 80**
3550 BC

Acropora palmata samples n, o, p, q of 18 samples, a through r,

recovered from −4.27 to −5.49m; presumably from −4.88 to −5.49m. Water depth 0.6m on low tide. Part of present reef framework.

Tx-1169. Reef Crest, Hole 2 **5050 ± 100** **3100 BC**

Acropora palmata and *Montastrea annularis* samples 0 and r of 22 samples, a through r, from −1.21 to −4.27m; presumably from −3.35 to −4.27m. Last 1.21m recovered Pleistocene, thus these samples overlie Pleistocene unconformity. From present reef framework, water depth 1.21m.

Tx-1170. Reef Crest, Hole 3 **470 ± 70** **AD 1480**

Montastrea annularis samples 9-12 of 28 samples, 1-12, recovered from −1.10 to −2.44m. Immediately overlying Pleistocene unconformity. Water depth 1.07m.

General Comment (LSL): samples record Recent rise of sea level along coast of N Jamaica, assuming that reef corals colonized Pleistocene limestone substrate as soon as it was submerged.

Discovery Bay Core 306 series, Jamaica

Carbonate mud samples from E-33G/70-71, Sta #16331, Core 306, Discovery Bay Harbor, Jamaica (18° 27′ 30″ N, 77° 24′ 24″ W). Recent sediment filling harbor. Coll 1971 and subm by L S Land. Depths are below sediment-water interface. For comment, see Core 420 series, below.

Tx-1296. Core 306, 50 to 55cm **1640 ± 80** **AD 310**

Tx-1297. Core 306, 205 to 210cm **2950 ± 80** **1000 BC**

Tx-1298. Core 306, 350 to 355cm **3510 ± 80** **1560 BC**

Tx-1299. Core 306, 510 to 520cm **4180 ± 90** **2230 BC**

Discovery Bay Core 420 series, Jamaica

$CaCO_3$ mud from R/V Eastward Sta #19498, Piston Core 420, Discovery Bay, Jamaica (18° 28′ 24″ N, 77° 25′ 36″ W). Recent carbonate sediment filling bay. Coll 1972 and subm by L S Land. Depths are below sediment-water interface.

Tx-1567. Core 420, 700 to 710 cm **4550 ± 80** **2600 BC**

Tx-1568. Core 420, 900 to 910cm **5100 ± 90** **3150 BC**

Bottom of piston core.

General Comment on Core 306 and Core 420 series (LSL): samples

document rate of accumulation of fine-grained carbonate muds behind reef in Discovery Bay.

Discovery Bay Core 289 series, Jamaica

Calcite and clay from E-33G/70-71, Sta #16283, Piston Core 289, 2600m offshore, Discovery Bay, Jamaica (18° 35′ 0″ N, 77° 23′ 42″ W). Deep-sea sediment. Coll 1971 and subm by L S Land. Depths are below sediment-water interface.

Tx-1300. Core 289, 185 to 195cm **28,820 ± 1050 / 26,870 BC**

Tx-1301. Core 289, 490 to 500cm **32,810 ± 1720 / 30,860 BC**

General Comment (LSL): samples document rate of pelagic carbonate sedimentation in deep water off N coast of Jamaica.

Tx-1125. Discovery Bay JS-296 **2510 ± 80 / 560 BC**

Calcite from submarine diamond core sample, 125 to 175cm below floor of dynamited quarry, near toe of *Acropora cervicornis* tongue, SW diving buoy, Discovery Bay, Jamaica (18° 28′ 06″ N, 77° 24′ 48″ W). Below Tx-930 (R, 1972, v 14, p 472). Coll 1970 and subm by L S Land. *Comment* (LSL): documents rate of reef sedimentation in deep reef frame. See also Sand Channel series and Blast Site series, below.

Discovery Bay Sand Channel series, Jamaica

$CaCO_3$ samples from sand channel E of Mine, SW Discovery Bay diving buoy, Jamaica (18° 28′ 06″ N, 77° 24′ 48″ W). Coll 1971 by John Gifford and L S Land; subm by L S Land. For comment, see Discovery Bay Blast Site series, below.

Tx-1321. JS-31 **530 ± 60 / AD 1420**

Sand, 1m below sand level, immediately overlying lithified surface. Reef sand in sand channel, recent sediment.

Tx-1322. JS-31aa **860 ± 80 / AD 1090**

$CaCO_3$ (aragonite and magnesium-calcite) chips off lithified surface, 1m below level of sand channel. From reef framework, lithified.

Tx-1323. JS-31n **2240 ± 80 / 290 BC**

$CaCO_3$ (aragonite), 1m below lithified surface, *Diploria strigosa* head obtained by underwater diamond core drilling. Coral in recent reef framework.

Tx-1324. JS-31y **3570 ± 70 / 1620 BC**

$CaCO_3$ (aragonite), 2m below lithified surface, *Montastrea annularis*

head obtained by underwater diamond core drilling. Coral in recent reef framework.

50 ± 70

Tx-1325. JS-31ac **Modern**

Coral (*Diochocoenia stokesii*) growing on lithified surface, 1m below level of sand channel. Recent lithified reef framework.

Discovery Bay Blast site series, Jamaica

Calcite and aragonite samples from JS-hole, 180ft (55m), just below drop-off, N of Pinnacle I, W of diving buoy, Discovery Bay, Jamaica (18° 28′ 06″ N, 77° 24′ 48″ W). Recent deep reef framework. Samples from ca 30cm below reef-water interface. Coll 1971 by Land and Copland; subm by L S Land.

6870 ± 80

Tx-1326. JS-hole, flat slab **4920 BC**

1370 ± 70

Tx-1327. JS-hole, massive **AD 580**

General Comment on Tx-1125, Tx-1321-1327 (LSL): samples document rate of reef sedimentation in deep reef frame and in active sand channel (Land, L S, Carbonate productivity and growth rate of a West Indian (Jamaican) reef; 2nd internatl symposium on coral reefs, Australia, in press).

Falmouth formation, Site #27 series, Jamaica

$CaCO_3$ (aragonite and calcite), beside small bar, opposite quarry, 32m NNE of rd, W of Rio Bueno, Jamaica (18° 28′ 25″ N, 77° 27′ 37″ W). Falmouth formation, Pleistocene, 120,000 yr old by U/Th. Coll 1970 by Land and Copland; subm by L S Land.

22,150 ± 550

Tx-1333. RB-27-8,9 **20,220 BC**

Samples 8 and 9 in diamond core, 3.35m below ground level, above water table.

29,140 ± 1320

Tx-1334. RB-27-21 **27,190 BC**

Sample 21 in diamond core, 4.27m below ground level, below water table.

Falmouth formation, Site #28 series, Jamaica

$CaCO_3$ (aragonite & calcite), halfway between Discovery Bay and Fort Point, Jamaica, midway between Fort Point Rd and Kaiser airstrip, right side of rd (18° 28′ 25″ N, 77° 24′ 50″ W). Falmouth formation. Coll 1970 by Land and Comer; subm by L S Land.

24,810 ± 770

Tx-1335. RB-28-12, 13 **22,860 BC**

Samples 12 and 13 in diamond core, 0.6m below ground level, above water table.

Tx-1336. RB-28-38, 42 **>44,000**

Samples 38 and 42 in diamond core, between 3 and 3.9m below ground level, below water table.

General Comment on Falmouth formation series (LSL): since 3 of these 120,000 yr-old samples give finite ^{14}C ages, investigators should mistrust ^{14}C ages in excess of 20,000 yr unless verified by independent techniques (Land, 1973).

III. ARCHAEOLOGIC SAMPLES

George C Davis site, Texas

Samples of wood charcoal (except as noted) from George C Davis site (41 CF 19), early Caddo site, E side Neches R valley, 9.6km SW of Alto, Cherokee Co, Texas (31° 35′ N, 95° 10′ W). Dates are part of continuing dating project (for previous dates see R, 1970, v 12, p 626-629). Coll 1970, except where noted, and subm by D A Story, Dept Anthropol, Univ Texas, Austin; comments by DAS. In titles, F stands for Feature.

George Davis, Mound C series

Mound C is well-stratified, elaborate mortuary area with 6 stages of construction. Stage I (earliest) is large pre-mound burial pit (F134); Stages II-VI are mound construction phases, most assoc with burials. Samples listed in stratigraphic order, earliest to latest.

Tx-1206. Davis Mound C, F134 **1010 ± 80 AD 940**

Stage I, pre-mound burial, offering against N wall of pit; organic material, not yet id.; possibly cane.

Tx-1294. Davis Mound C, F155 **1260 ± 70 AD 690**

Stage II burial, unid. organic material assoc with skull.

Tx-1295. Davis Mound C, F161 **1240 ± 100 AD 710**

Stage III burial, unid. organic material assoc with skull.

Tx-1203. Davis Mound C, F166 **910 ± 80 AD 1040**

Charcoal-filled pit under washed mound fill (F162) and mound additions of Stages V and VI, otherwise stratigraphic position uncertain.

Tx-1231. Davis Mound C, F118 **770 ± 80 AD 1180**

Stage IV burial, unid. organic material assoc with skull.

General Comment: except for Tx-1206 date on pre-mound burial pit, dates are in reasonable stratigraphic order, although Stages II (Tx-1294) and III (Tx-1295) are earlier and more similar in age than anticipated. Tx-1231 suggests that Stages V and VI are later than AD 1100 or 1200. F166 (Tx-1203) is stratigraphically earlier than Stages V and VI; date suggests it may also predate IV.

George Davis, F125 series

F125 is small circular structure in excavation Unit 10 in village area N of Mound B; structure has clay-lined hearth with 3 successive burnings.

1080 ± 80

Tx-1202. Davis F125-82 **AD 870**

From possible roof-support pit.

1110 ± 80

Tx-1204. Davis F125-1a **AD 840**

From hearth, 1st burning.

1030 ± 70

Tx-1307. Davis F125-1b **AD 920**

From hearth, 2nd burning.

800 ± 70

Tx-1308. Davis F125-1bb **AD 1150**

Cane and possibly corn stalk fragments from hearth, 2nd burning.

920 ± 80

Tx-1201. Davis F125-1c **AD 1030**

From hearth, 3rd (final) burning.

General Comment: Tx-1204, -1307, -1201 form consistent but rather long stratigraphic series. Tx-1202 was thought to be same age as, or later than Tx-1201, but dates indicate it is earlier even with 1σ agreement. Tx-1308 date on cane and possible corn is, as expected, later than Tx-1307 on woody charcoal from same provenience.

George Davis, F139-160 series

F139 and F160 are adjacent circular house patterns, and small charcoal-filled pits, in Excavation Unit 11 in village area S of Mound B.

890 ± 80

Tx-1210. Davis F160-54 **AD 1060**

Pit N of F160 house, not clearly assoc with it or F139.

860 ± 80

Tx-1211. Davis F139-21 **AD 1090**

Pit near F139 house.

1160 ± 90

Tx-1212. Davis F139-1 **AD 790**

From upper part of fill in tree mold within F139 house.

950 ± 80

Tx-1213. Davis F139-83 **AD 1000**

From fill of outer post of F139 house.

670 ± 90

Tx-1310. Davis F139-62, cane **AD 1280**

Charred cane from pit inside F139 house, near SW portion of outer wall of structure.

Tx-1313. Davis F139-62, wood charcoal — **850 ± 70** / **AD 1100**
Same provenience as Tx-1310.

Tx-1311. Davis F136-13 — **880 ± 80** / **AD 1070**
Pit N of F139 & F160 houses, of uncertain assoc.

Tx-1312. Davis F136-6 — **750 ± 90** / **AD 1200**
Pit N of F139 house.

Tx-1314. Davis F139-84 — **700 ± 70** / **AD 1250**
Pit near F139 house.

Tx-1315. Davis F139-50 — **910 ± 60** / **AD 1040**
Pit or post hole inside F139 house, near SW portion of outside wall.

Tx-1316. Davis F139-7 — **810 ± 70** / **AD 1140**
Pit about 0.5m beyond outer wall of F139 house.

Tx-1317. Davis F139-30, wood charcoal — **760 ± 100** / **AD 1190**
Pit NW of F139 house.

Tx-1405. Davis F139-30, corn — **570 ± 80** / **AD 1380**
Same provenience as Tx-1317.

Tx-1318. Davis F139-90 — **740 ± 110** / **AD 1210**
Pit near F139 house.

Tx-1319. Davis F139-3 — **690 ± 70** / **AD 1260**
PiPt within F139 house.

Tx-1320. Davis F160-52 — **740 ± 60** / **AD 1210**
Pit near F160 house.

General Comment: dates indicate late village occupation, and form 2 clusters, ca AD 1000 to 1170 and ca AD 1150 to 1300. They do not tightly date structures but do suggest possibility that F139 and F160 houses are of different ages. Paired wood charcoal and corn or cane samples Tx-1310/1313 and Tx-1317/1405 differ about as expected.

George Davis, F126 series

F126 is group of small charcoal-filled pits and possible post, probably representing outdoor activity area, in Excavation Unit 13 in village area S of Mound B.

Tx-1214. Davis F126-2 — **790 ± 80** / **AD 1160**

Tx-1215. Davis F126-8 — **850 ± 90** / **AD 1100**

General Comment: dates are consistent with others from village.

George Davis, F137 series

F137 is group of small pits, probably representing outdoor activity area, in Excavation Unit 14 in village area S of Mound B.

Tx-1208. Davis F137-16B — **1070 ± 70** / **AD 880**

Tx-1209. Davis F137-15 — **860 ± 80** / **AD 1090**

General Comment: dates suggest 2 pits relate to different times of use, although they are only 1.2m apart.

George Davis, F146 series

F146 is circular structure with small charcoal-filled pits inside and outside, in Excavation Unit 15 in village area W of Mound A.

Tx-1221. Davis F146-69 — **1000 ± 80** / **AD 950**

Pit within F146.

Tx-1222. Davis F146-71 — **1100 ± 80** / **AD 850**

Pit just outside E wall of F146.

Tx-1223. Davis F146-164 — **1290 ± 80** / **AD 660**

Apparent post within F146.

Tx-1224. Davis F146-62 — **980 ± 70** / **AD 970**

Pit cut into 2 outer-wall posts of F146.

General Comment: Tx-1224 is stratigraphically later than structure; date is appropriately later than Tx-1223, a possible interior post. Tx-1221 and Tx-1222 are from possible cooking or smudge pits. Dates suggest pits represent use of area after abandonment of structure.

George Davis, F165 series

F165 is probable outdoor activity area, in Excavation Unit 16S in village area N of Mound B, N of Structure 125.

Tx-1216. Davis F165-1 — **780 ± 70** / **AD 1170**

Small charcoal-filled pit.

1020 ± 70

Tx-1217. Davis F165-63 **AD 930**

Possible post.

General Comment: dates do not agree; possibly refer to different periods of use.

George Davis, Borrow Pit series

Borrow Pit is depression in terrace slope W of Mound B, probable source of some of fill used in mound construction and in pottery making. Stratified deposits within pit contained washed and discarded cultural debris.

410 ± 70

Tx-1207. Davis Borrow Pit, 164 **AD 1540**

Sq N737/W1156, alt 90.94m; Stratum 1, disturbed A horizon.

850 ± 60

Tx-1228. Davis Borrow Pit, 61 **AD 1100**

Test pit, Level 5 (probably Stratum 5), 140 to 160cm below surface.

790 ± 240

Tx-1229. Davis Borrow Pit, 44 **AD 1160**

Same provenience as Tx-1228.

General Comment: Tx-1207 much too late for assoc with Caddoan occupation. Tx-1228 and -1229 agree well and fit other dates from site, although large error for Tx-1229 reduces significance.

George Davis, Mound B1 series

Samples from 1st phase of construction of Mound B. Charcoal scattered in fill, not assoc with cultural features.

910 ± 140

Tx-1225. Davis Mound B, 46 **AD 1040**

700 ± 80

Tx-1226. Davis Mound B, 26 **AD 1250**

1100 ± 70

Tx-1227. Davis Mound B, 45 **AD 850**

General Comment: previously dated samples from pre-Mound B context (R, 1970, v 12, p 626-628) indicate mound construction began after AD 1050 or 1100. Tx-1226 fits this situation best. Tx-1225 is consistent with Tx-1226, but large error diminishes significance. Tx-1227 too early to be relevant to dating, but probably reflects mixed origin of mound fill.

George Davis, Mound A series

Samples coll 1960-61 by H P Newell (Newell and Krieger, 1949). Stored in paper bag for 30 yr.

830 ± 80

Tx-1395. Davis Mound A, 211 **AD 1120**

Beneath Mound A, Sec 13, 6.44 to 6.84m below datum, apparently assoc with F31 structure.

1130 ± 60

Tx-1399. Davis Mound A, 216 **AD 820**

Beneath Mound A, Sec 13, from post hole assoc with F31.

710 ± 70

Tx-1396. Davis Mound A, 212 **AD 1240**

From Structure F9, near SE edge of Mound A, largely covered by wash from mound. Sec 19R3, 6.44m below datum.

890 ± 60

Tx-1397. Davis Mound A, 213 **AD 1060**

Apparently from F9 (see Tx-1396). Sec 20R13, 25 to 38 cm below surface. Sample was split and 2 parts prepared and counted separately: 900 ± 70, 880 ± 90.

1050 ± 70

Tx-1398. Davis Mound A, 214 **AD 900**

Partly covered by Mound A wash, just above floor of Structure F35. *General Comment*: Tx-1395 and -1399 from F31, structure beneath mound, do not agree. There are 3 previously dated samples from this structure: C-153, 1553 ± 175 (Libby, 1955, p 108); M-1186, 655 ± 75 (R, 1963, v 5, p 241); Tx-105, 1120 ± 90 (R, 1964, v 6, p 155). Tx-1399 and -105 agree closely and best fit general intra-site chronology as now understood, but as Tx-105 was mixture of wood charcoal and charred corn its significance is uncertain. C-153, M-1186, and Tx-1396 are felt to be far from true age of F31. Tx-1396 and -1397 from F9 do not agree. F9 and F35 (Tx-1398) do not have clear stratigraphic relationship to construction of Mound A; significance of these dates is not yet clear.

General Comment on Davis site dates: in general, dates fit other chronologic evidence from site and support Krieger's view (Newell and Krieger, 1949, p 193-237) that Davis is one of earliest known Caddoan sites. Village occupation may have begun in 8th or 9th century and lasted until ca AD 1300. Special burials in village beneath Mound B seem equally early and may have continued after much of village was abandoned. Mound B itself seems late, probably about same age as burial stages V and VI in Mound C. Dates from beneath Mound A not consistent and do not preclude possibility that Mound A predates Mound B.

Trinity Bay Estuary, Upper Texas Coast

Samples of shell (*Rangia cuneata*) and charcoal from sites in Wallisville Reservoir area at mouth of Trinity R, E of Houston, Texas, and at Harris County Boy's School site S of Houston, subm as part of study of prehistory of upper Texas coast. In this area datable charcoal is rare in archaeologic sites but shells are abundant. L E Aten (ms in

preparation), using measurements of 13 shell-charcoal sample pairs and 1 shell date assoc with historic event of known age (these dates are reported below and in R, 1970, v 12, p 263-266), obtained correlation coefficient of 0.985, and derived following regression equation:

$$A_c = .995A_a - 225.241$$

where A_c = corrected age (based on predicted ^{14}C activity if sample were wood charcoal)

A_a = apparent age (based on measured ^{14}C activity of shell carbonate)

Standard error of estimate of A_c is 103 yr. This equation is felt to be applicable only to samples from upper reaches of Trinity Bay estuary and geochemically similar environments.

Except where noted, all samples coll 1969 and subm by L E Aten, Texas Archeol Survey, Univ Texas, Austin. Comments by LEA. In comments, "corrected age" refers to age A_c above.

Tx-953. 41 CH 170, 1 **1110 ± 50** **AD 840**

Shell from hearth adjacent to main shell lens, site 41 CH 170, 2.6km SE of Cove, Texas, in marsh E of Old River Lake (29° 49′ N, 94° 47′ W). Site had no diagnostic artifacts. *Comment*: corrected date AD 1071, indicating occupation during Round Lake period.

Tx-1050. 41 CH 9, 1 **1650 ± 70** **AD 300**

Shell from Site 41 CH 9, 2.25km E of Trinity R, 1.9km S of Interstate Hwy 10 (29° 48′ N, 94° 43′ W). From buried natural clam bed in nearshore estuarine (Turtle Bay) facies underlying beach ridge on which site was established; should date maximum age of beach ridge. *Comment*: corrected date: AD 533. Earliest occupation on this beach ridge was during Mayes Island period (AD 350 to 600). Present date indicates relatively short interval between shoreline progradation, beach-ridge formation, and establishment of occupation, probably directly on bay front.

Tx-1051. 41 CH 24, #3 **1560 ± 80** **AD 390**

Shell from base of midden, S corner Unit A, Site 41 CH 24, N bank of Lost R, 1.6km upstream from Interstate Hwy 10 bridge (29° 51′ N, 94° 47′ W). Immediately overlies levee sand of Channel Stage 3; should give minimum age of that stage and initial occupation of site. *Comment*: corrected date: AD 623. Ceramics indicate initial occupation during Round Lake period, not earlier than AD 950. Date, however, should (and does) agree with Tx-1057 (below), reinforcing interpretation of assoc with immediately post-Stage 3 events. Perhaps sparse occupation earlier than Round Lake period escaped detection in test excavation.

1510 ± 80

Tx-1057. 41 CH 165, #1 **AD 440**

Shell, 25cm below surface at base of shell midden in Site 41 CH 165, exposed in wave-cut bank along E shore of Old River Lake, 1.6km S of Interstate Hwy 10 (29° 49′ N, 94° 47′ W). Immediately overlies backswamp facies probably assoc with Channel Stage 3; age should be minimum for that stage. *Comment*: corrected date, AD 673, correlates well with Tx-1051, above, indicating that Channel Stage 3 was terminated by 1st half of 7th century AD.

3270 ± 80

Tx-1058. 41 CH 172, #2 **1320 BC**

Shell, 15cm above base of buried shell midden, Site 41 CH 172, 0.3km W of Lost R, 0.4km N of Interstate Hwy 10 (29° 50′ N, 94° 48′ W). Midden overlies levee sand from adjacent distributary channel of unknown origin. *Comment*: corrected date 1078 BC. Site is oldest yet discovered in alluvial deposits of lower Trinity R. Age is minimum for assoc abandoned channel segment that antedates Channel Stage 1.

41 CH 36 series

Charcoal and shell from Unit A, Site 41 CH 36, shell midden on N shore of Old River Lake immediately W of mouth of Round Lake Bayou (29° 48′ N, 94° 46′ W).

1100 ± 70

Tx-946A. 41 CH 36/3, shell **AD 850**

720 ± 90

Tx-946B. 41 CH 36/3, charcoal **AD 1230**

From hearth in SE corner, depth 81 to 85cm. Assoc with Round Lake period ceramics. *Comment*: corrected date for Tx-946A, AD 1081.

1300 ± 70

Tx-947A. 41 CH 36/4, shell **AD 650**

1120 ± 110

Tx-947B. 41 CH 36/4, charcoal **AD 830**

Shell taken from E wall of excavation, 165cm depth; charcoal scattered through fill, depth 160 to 170cm. Samples assoc with Turtle Bay ceramics. *Comment*: corrected date of Tx-947A, AD 882.

1470 ± 70

Tx-948. 41 CH 36/5, shell **AD 480**

From base of midden, depth 195cm, immediately overlying levee sand probably from Trinity R Channel Stage 3. Age should be minimum for abandonment of that channel stage. *Comment*: corrected date AD 713.

41 CH 46 series

Charcoal and shell from hearth in SW corner Unit A, 40 to 42cm depth, at Site 41 CH 46, NW shore Round Lake, 3.2km ESE of Cove,

Texas (29° 49′ N, 94° 46′ W). Ceramics indicate hearth was at stratigraphic contact between Mayes Island period and either Round Lake or Old River period.

Tx-949A. 41 CH 46/1, shell **1740 ± 70** **AD 210**

Tx-949B. 41 CH 46/1, charcoal **1120 ± 70** **AD 830**

Comment: corrected date of Tx-949A, AD 444, compatible with current estimates for Mayes Island period; Tx-949B is at lower limit of current estimates of age for Round Lake period.

41 CH 98 series

Charcoal and shell from lower shell zone, S wall Unit A, Site 41 CH 98, 0.4km SE of Cove Point on W bank Cotton's Bayou (28° 48′ N, 94° 48′ W). Shell zone is at base of midden, overlying marsh clay. Assoc with initial occupation of site during Mayes Island period.

Tx-951B. 41 CH 98/5, shell **1310 ± 60** **AD 640**

Tx-951A. 41 CH 98/5, charcoal **1060 ± 90** **AD 890**

Comment: corrected date of Tx-951B, AD 872. However, Mayes Island period is AD 350 to 600; thus both dates are much too young. On all objects at this level of midden there was considerable $CaCO_3$ encrustation, presumably derived from higher (younger) shell deposits; this might be source of contaminants.

41 CH 57 series

Shell from Site 41 CH 57, 0.8km N of Trinity R at Wallisville (29° 50′ N, 94° 45′ W). Coll 1970 by W L Fullen; subm by L E Aten.

Tx-1113. 41 CH 57, 1 **3670 ± 90** **1720 BC**

From base of Shell Zone 2, preceramic component underlying and stratigraphically separated from historic occupation at site. Near middle of E wall Sq S24.5/E70. Should fall between Tx-397 (2540 ± 110; R, 1970, v 12, p 264) and Tx-969 (3670 ± 80; this list). *Comment*: corrected date, 1476 BC, reasonable for early shell middens in this area and identical to Tx-969 from site on opposite side of Galveston Bay.

Tx-1114. 41 CH 57, 2 **5570 ± 100** **3620 BC**

In NW quad Sq S79-E71, from top of thin compact shell lens containing post molds and with subrectangular outline; no habitation refuse. Lens is presumed to be sub-floor of European structure, ca 1756. *Comment*: evidence exists that *Rangia cuneata* shells deposited in physical contact with Beaumont formation will yield unusually old dates,

eg, O-912 (Ring, 1961, p 318), Tx-642-644, -654 (R, 1970, v 12, p 275). This appears to be problem with Tx-1114 as well.

Harris County Boys' School series

Samples from Sites 41 HR 80 and 41 HR 85 at Harris County Boys' School, 0.7km N of Clear Lake on E bank of Mud Lake, S of Houston, Texas (29° 34′ N, 95° 04′ W).

Tx-1059. 41 HR 80, Burial 1 **640 ± 130** **AD 1310**

Human bone from Burial 1, Sqs N-98, N-99, M-98, 20cm below surface, Site 41 HR 80. Cultural assoc uncertain but probably Turtle Bay period. Coll 1968 by R M Gramley.

Tx-1060. 41 HR 80, Burial 2 **2140 ± 380** **190 BC**

Human bone from Burial 2, Sq M-98, 17.5cm below surface, Site 41 HR 80. Probably later than Burial 1 (Tx-1059, above), but same cultural assoc. Coll 1968 by R M Gramley.

General Comment: dates do not agree with age of Turtle Bay period (AD 600 to 950), and Tx-1060 is older than Clear Lake period (AD 100 to 350), into which midden the burials are intrusive. Also, dates do not agree with each other, and relationship is reverse of probable stratigraphic relationship. No archaeologic explanation is apparent for these discrepancies.

Tx-968A. 41 HR 85/1, charcoal **2170 ± 180** **220 BC**

Charcoal fragments from throughout midden of Level 2, depth 10 to 25cm, Site 41 HR 35, assoc with Goose Creek Plain and Tchefuncte Plain ceramics; earliest ceramics at site. *Comment*: since Level 2 spans preceramic-ceramic transition and charcoal is from throughout level we would expect date to be earlier than AD 100, time of 1st appearance of ceramics in this area (Aten, ms in preparation).

Tx-968B. 41 HR 85/1, shell **1500 ± 70** **AD 450**

Shells from bulk matrix Sample #2A from N wall of Test Pit 2, Site 41 HR 85, in upper part of Level 2, 10 to 25cm depth. *Comment*: corrected date: AD 683, late relative to Tx-968A but consistent with ceramics of still later date immediately above in Level 1, and with observation that middens on upland bluffs around Galveston Bay accumulated very slowly.

Tx-969. 41 HR 85/2, shell **3670 ± 80** **1720 BC**

Shells (*Rangia*) from bulk matrix Sample #4 from N wall of Test Pit 2, Site 41 HR 85, 65 to 70cm depth. Preceramic level. *Comment*: corrected date: 1476 BC. Appropriately earlier than Tx-968A & B, above, which are higher stratigraphically. Agrees with Tx-1113 (this list), preceramic component on opposite side of Galveston Bay.

Brazos Delta area, Texas Coast

All samples subm and commented on by L E Aten.

41 BO 15 series

Shell (*Rangia cuneata*) and charcoal from Site 41 BO 15, N shore Shy Pond, 1.25km N of airport at Lake Jackson, Brazoria Co, Texas (29° 03′ N, 95° 27′ W). Assocs were mainly Goose Creek Plain pottery.

860 ± 50

Tx-1116A. 41 BO 15/1, shell **AD 1090**

From top of shell zone between Trenches 2 and 4. Coll 1970 by D Hamilton.

180 ± 60

Tx-1116B. 41 BO 15/1, charcoal **AD 1770**

From top of shell zone from Trenches 2 and 4, and between Trenches 5 and 2. Coll 1957 by T R Hester.

General Comment: 1st shell-charcoal pair dated in study of shell dates in area; no correction of shell dates yet feasible (see also Tx-1259A & B, below). Archaeologic estimate of date of assemblage AD 1350 to 1500; if this is correct, Tx-1116B on charcoal is too young.

Dow-Cleaver site series

Shells (*Rangia cuneata*) from Site 41 BO 35, SW part of Dow Chemical Co Plant B, N side Brazos R, ca 3km WNW of city limits of Freeport, Brazoria Co, Texas (28° 58′ N, 95° 25′ W). Coll 1970 by L E Aten. Samples listed in stratigraphic order, most recent first.

1680 ± 70

Tx-1167. Dow-Cleaver 5; Zone 1 **AD 270**

From throughout Sq E-48 in Shell Zone 1, uppermost shell zone, buried by ca 10cm sterile overburden. Mandible of pig (*Sus scrofa*) found in zone; no evidence of intrusion. No other evidence of European contact. Native pottery assemblage (Goose Creek Plain, Goose Creek Incised, San Jacinto Plain, and plain and incised bone-tempered) unlike those in lower zones.

1330 ± 50

Tx-1205. Dow-Cleaver 6; Zone 1 **AD 620**

From Test Pit 1, Shell Zone 1; dated to check Tx-1167 (above) which seems too early.

1830 ± 80

Tx-1117. Dow-Cleaver 3; Zone 2B **AD 120**

Shell Zone 2B in trench wall between D49 and E49. Goose Creek Plain pottery; earliest appearance in site of San Jacinto Plain pottery and arrowpoints.

2360 ± 60

Tx-1066. Dow-Cleaver 1; Zone 3A **410 BC**

Shell Zone 3A between D49 and E49; upper part of earliest ceramic zone; Goose Creek Plain ceramics.

1250 ± 70

Tx-1115. Dow-Cleaver 4; Zone 3B **AD 700**

Shell Zone 3B, SE quad Unit E44; Goose Creek Plain ceramics.

2370 ± 80

Tx-1067. Dow-Cleaver 2; Zone 4 **420 BC**

Shell Zone 4, from walls and floor of NW quad of Unit E47. Preceramic.

General Comment: samples apparently affected by 2 sources of contamination with old carbon: 1) ancient carbon in delta waters, from carbonate rock of interior Texas through which Brazos R flows; 2) chemical wastes discharged by large chemical plant adjacent to site. For detailed discussion, see Aten (1971, p 47-50).

41 BO 50 series

Paired samples of charcoal and shell (*Rangia cuneata*) from Sq 1, Zone 2 in Site 41 BO 50, N shore of S bend of L Jackson, 3.6km N of center of city of Lake Jackson, Brazoria Co, Texas (29° 03′ N, 95° 28′ 30″ W).

1650 ± 90

Tx-1259A. 41 BO 50, 1A; charcoal **AD 300**

1870 ± 70

Tx-1259B. 41 BO 50, 1B; shell **AD 80**

Comment: dated as part of study of shell/charcoal dating relationship in area. Tx-1259A not unreasonable but indicates that previous estimates for introduction of sandy paste ceramics and arrow points into area may be too recent (Aten, 1971, p 50-54).

Sabine Lake Area, Texas-Louisiana Coast

2020 ± 110

Tx-1230. Conway D/1, Louisiana **70 BC**

Shell (*Rangia cuneata*) from buried midden exposed in cut bank of Conway Bayou, ca 0.8km upstream from its confluence with Sabine R in Calcasieu Parish, Louisiana (30° 04′ N, 93° 42′ W). Site has mostly Tchefuncte period ceramics; some Marksville-influenced ceramics appear late. Sample assoc with Tchefuncte Plain vessel, stratigraphically about midway in Tchefuncte deposits. Coll 1971 by C N Bollich; subm by L E Aten. *Comment* (LEA): no basis yet for appraising dates on *Rangia cuneata* in this drainage. Relatively low HCO_3 values measured today (Hahl and Ratzlaff, 1970) may indicate negligible addition of non-radioactive carbon from geologic ancient deposits; if true, no correction would be necessary for shell dates here. Present date is entirely com-

patible with current estimates of age of this cultural context (Gagliano, 1967, p 11).

Other Texas Samples

Tx-1306. George L Keith site, Texas **540 ± 70** **AD 1410**

Charcoal fragments from George L Keith site (41 TT 11), E edge Hart Creek flood plain 1.5km E of Mt Pleasant, Texas (33° 09′ N, 94° 56′ W). From different lenses and zones of mound fill, ca 102.6 to 106m elev, exposed in fresh cut in S wall, E end of trench excavated in 1934 by Goldschmidt (1935, p 97-99). Charcoal appears to derive from pre-existing midden deposits incorporated into mound fill; date should indicate time at or after which middle 3rd of mound was built. No stratigraphic breaks observed; no diagnostic artifacts assoc. Coll 1971 and subm by K M Brown, Dept Anthropol, Northwestern Univ, Evanston, Illinois. *Comment* (KMB): premound and mound construction phases appear to be Sanders focus, similar to other Sanders components S of Red R. Date somewhat later than expected, and suggests construction of large platform mounds relatively late in this area. Overlap with early end of ^{14}C date range for Whelan complex (see comments, Harroun site series, R, 1966, v 8, p 461-462) may also indicate rather rapid cultural change in area ca AD 1300 to 1400.

Loeve-Fox series, central Texas

Wood charcoal samples from Loeve-Fox site (41 WM 230), left bank San Gabriel R, 8km NNE of Taylor, Williamson Co, Texas, in Laneport Reservoir basin (30° 39′ 25″ N, 97° 24′ 58″ W). Coll 1972 and subm by E R Prewitt, Texas Archeol Survey, Univ Texas, Austin.

Tx-1765. Loeve-Fox 13c **850 ± 100** **AD 1100**

Feature 4, hearth, N895/W990, 46 to 61cm below surface. Overlain by unstemmed arrowpoints, underlain by Darl points. *Comment* (ERP): dates transition from dart points to arrowpoints.

Tx-1766. Loeve-Fox 8 **1600 ± 110** **AD 350**

Tx-1767. Loeve-Fox 3 **1480 ± 170** **AD 470**

Tx-1766 and -1767 from Feature 8, midden zone, N1060/W990, 76 to 81.5cm below surface. Large error due to small size of samples. *Comment* (ERP): dates agree. Feature 8 has Darl points assoc; above are Scallorn points, below are Ensor, Fairland, Montell. Dates support previous estimates of beginning date for terminal Archaic in central Texas.

Walker #2 series, Texas

Charcoal samples from 2 rock-lined cooking pits at Walker #2 site (41 CK 137; Shafer, 1971, p 113-127), 8km SW of Silver, Coke Co,

W central Texas, on 1st terrace of Colorado R, in basin of Robert Lee Reservoir (32° 05′ N, 100° 40′ W). No artifact assoc. Coll 1969 and subm by H J Shafer, Texas Archeol Salvage Project, Univ Texas, Austin.

110 ± 140

Tx-892. Walker #2, Feature 4 **Modern**

From Feature 4, a cooking pit. Presence of some uncharred wood, not decayed, suggests recent age.

240 ± 70

Tx-893. Walker #2, Feature 5 **AD 1710**

From Feature 5, a cooking pit.

General Comment (HJS): cooking pits are foreign to the Plains except for those of Dismal River aspect (Apache, ca AD 1675-1725) NW of this location. Tx-893 agrees with Dismal River date and reinforces suggestion that pits were made by Apache.

Northgate Site series, Texas

Charcoal from House #1 (Feature 183), Northgate site (41 EP 6), 11.3km N of downtown El Paso, 0.4km NW of intersection of Diane Rd and Dyer St, Ft Bliss military reservation, Texas (31° 52′ 57″ N, 106° 25′ 39″ W). Southern Jornada branch occupation. Coll 1972 and subm by L E Aten.

1220 ± 130

Tx-1450. Northgate #8 **AD 730**

Roof beam#I, lying on floor of house.

1200 ± 70

Tx-1451. Northgate #10 **AD 750**

Roof Beam #III, lying on floor of house.

General Comment (LEA): samples are from undisturbed context; assoc ceramics were El Paso Brown and Mimbres Classic Black-on-White. Assoc house structure was probably of jacal construction over excavated house-pit ca 15cm deep. Thus, dates suggest an earlier brownware-Mimbres Black-on-white assemblage than was previously thought.

Arkansas

Hazel site series, Arkansas

Samples of charcoal (except where otherwise noted) from Hazel site, on Little R near Marked Tree, Poinsett Co, NE Arkansas (35° 32′ N, 90° 24′ W). Three developmental stages of St Francis Valley Mississippian sequence are present: Group I, Early Mississippi; Group II, Middle Mississippi, like Lawhorn site (Moselage, 1962); Group III, Late Mississippi, like Parkin phase. Coll 1933 by J Durham; subm by M Zinke, Univ Arkansas Mus, Fayetteville.

1120 ± 70

Tx-700A. Hazel 933A, charcoal **AD 830**

Tx-700B. Hazel 933A, corncobs **660 ± 70** **AD 1290**

Tx-844. Hazel 933B, charcoal **860 ± 70** **AD 1090**

Tx-878A. Hazel 933C, charcoal **760 ± 60** **AD 1190**

Tx-878B. Hazel 933C, corncobs **420 ± 60** **AD 1530**

Tx-700, -844, -878 are from same field sample, from Trench 5, Level II; Group 1. *Comment* (SV, Jr, & EMD): discrepancy between corn and wood in Tx-700 is greater than what we usually found; with Tx-878 discrepancy is within usual range. In view of Tx-844, true ^{14}C age is probably ca 800 yr.

Tx-845. Hazel 400 **870 ± 100** **AD 1080**

Trench 5, Level III; Group I.

Tx-704. Hazel 950 **840 ± 80** **AD 1110**

Trench 5, Level V; Group II.

Tx-705. Hazel 1039 **690 ± 70** **AD 1260**

Burial 490, Burial Cluster 7; Group II.

Tx-851. Hazel 445c **470 ± 70** **AD 1480**

Tx-876. Hazel 445h **690 ± 70** **AD 1260**

Tx-851 and -876 are from Burial 455; Tx-851 was 33cm deeper than Tx-876. Burial Cluster 10; Group II.

Tx-846. Hazel 868 **370 ± 180** **AD 1580**

Trench 5, Level VII; Group III.

Tx-847. Hazel 972 **370 ± 70** **AD 1580**

Trench 5, Level VII; Group III.

Tx-848. Hazel 897A **600 ± 90** **AD 1350**

Tx-877. Hazel 897B **500 ± 80** **AD 1450**

Tx-848 and -877 are from same field sample, from Trench 5, Level VII; Group III.

Tx-849. Hazel 460 **410 ± 70** **AD 1540**

1m W of Burial 460, 54cm deep; Group III.

Tx-850. Hazel 1052-473 **490 ± 70**
AD 1460

94cm deep; Group III.

General Comment (MZ): Group I appears to date ca AD 1100 to 1200; Group II, AD 1200 to 1300; Group III, AD 1400 to 1600.

Tx-1541. Dillard 57, Arkansas **560 ± 50**
AD 1390

Wood charcoal from post of burned structure covered by small conical mound, on large ovate temple mound, at Dillard Mound site (3CL25), 9km NW of Gurdon, Arkansas, on W bank Terre Noir Creek (34° 00′ N, 93° 11′ W). Gibson aspect Caddo site. Coll 1964 by J A Scholtz and subm by J C Weber, Arkansas Archeol Survey, Henderson State Coll, Arkadelphia, Arkansas. *Comment* (JCW): date indicates mound building was still practiced among E Caddo in 14th century.

Paw Paw site series, Arkansas

Wood charcoal (except as noted) from area 4 of Paw Paw site (3OU22), stratified site ca 30km SE of Camden, Arkansas, on old channel of Ouachita R (33° 28′ 30″ N, 92° 43′ 30″ W). Area 4 had 8 strata and 4 recognized cultural manifestations: Stratum 1 (highest), Plaquemine; Strata 2 and 4, late and early Coles Creek, respectively; Stratum 6, Paw Paw phase, earliest ceramic, assignable to Baytown and Lowland Fourche Maline; Stratum 8, Tom's Brook Archaic. Coll 1971, subm and commented on by J C Weber.

Tx-1542. Paw Paw 549, Stratum 1 **740 ± 50**
AD 1210

W25N31, Feature 26, pit originating in Stratum 1 and extending into Stratum 3.

Tx-1548. Paw Paw 437 & 542, Stratum 1 **870 ± 60**
AD 1080

W23N29, W23N31, S halves, bottom of Stratum 1.

Comment on Tx-1542, -1548: dates support archaeologic estimate of age of Plaquemine.

Tx-1543. Paw Paw 444, Stratum 2 **990 ± 40**
AD 960

W23N29, S half.

Tx-1544. Paw Paw 564, Stratum 2 **1170 ± 50**
AD 780

W23N31, S half.

Comment on Tx-1543, -1544: assoc with sherds of Coles Creek Incised, varieties Hardy and Blakely; dates support archaeologic estimate of AD 800 to 1000 for this occupation.

Tx-1545. Paw Paw 580-1, Stratum 4 **1110 ± 40**
AD 840

W23N31, S half.

950 ± 40

Tx-1546. Paw Paw 580-2, Stratum 4 **AD 1000**

W23N31, S half.

Comment on Tx-1545, -1546: assoc with sherds of Coles Creek Incised varieties Campbellsville, Hunt, and Stoner, indicating date of AD 600 to 800. Dates more recent, and stratigraphically out of order with Tx-1543, -1544 from Stratum 2 (above). No explanation apparent.

1490 ± 40

Tx-1547. Paw Paw 597, Stratum 6 **AD 460**

W25N31, S half.

1290 ± 60

Tx-1552. Paw Paw 594, Stratum 6 **AD 660**

W25N31, S half.

Comment on Tx-1547, -1552: absence of Coles Creek Incised sherds makes Tx-1552 seem late; Tx-1547 supports archaeologic estimate of AD 200 to 500 for Stratum 6.

3450 ± 140

Tx-1549. Paw Paw 432, 438, 607, Stratum 8 **1500 BC**

Carbonized nut hulls, W21N29, 160 to 250cm below surface.

6640 ± 70

Tx-1550. Paw Paw 331, 384, 615, Stratum 8 **4690 BC**

Carbonized nut hulls, Area 2, E7N44 and E7N46; 100 to 130cm below surface.

Comment on Tx-1549, -1550: Tx-1550 supports previous estimates of 5000 to 3000 BC for Tom's Brook Archaic. Tx-1549 is anomalous.

Hays Mound series, Arkansas

Samples of wood charcoal (except cane charcoal where noted) from 4 successive building stages of Hays Mound, 8km S of Okolona, SW Arkansas on E bank Little Missouri R (33° 56′ N, 93° 19′ W). Stages are numbered Zero Mound to 3rd Mound, earliest to latest. Ceramic cross-dating suggests AD 1000 to 1200. Coll 1971 and subm and commented on by J C Weber.

770 ± 60

Tx-1534. Hays 193, Zero Mound **AD 1180**

House construction element, E104N94.

1030 ± 50

Tx-1535. Hays 205, Zero Mound **AD 920**

House construction post, E106N94.

750 ± 40

Tx-1536. Hays 184, Zero Mound **AD 1200**

House construction post, E104N92.

Comment on Zero Mound dates: Tx-1535 much earlier than anticipated and inconsistent with other 2 dates, which support each other.

760 ± 50

Tx-1538. Hays 138-1, First Mound **AD 1190**

House construction element, E102N92-94-96, E104N92-94-96.

930 ± 50

Tx-1539. Hays 138-2, First Mound **AD 1020**

As with Tx-1538.

740 ± 50

Tx-1540. Hays 138-3, First Mound **AD 1210**

As with Tx-1538.

Comment on First Mound dates: Tx-1538 and -1540 are consistent with each other and with Zero Mound dates (above); Tx-1539 seems falsely early.

780 ± 50

Tx-1529. Hays 115, Second Mound **AD 1170**

From ash lens, E100N100.

810 ± 50

Tx-1530. Hays 118, Second Mound **AD 1140**

As with Tx-1529.

950 ± 60

Tx-1531. Hays 123, Second Mound **AD 1000**

From ash lens, E98N100.

Comment on Second Mound dates: Tx-1529 and -1530 agree within 1σ with dates from Zero and First Mounds (above). Material seems to be firewood rather than house construction elements. Tx-1531 is too early to be consistent.

690 ± 50

Tx-1528. Hays 083, Third Mound **AD 1260**

Surface of Third Mound, E90N92.

540 ± 60

Tx-1532. Hays 231-1, 234-1, Third Mound **AD 1410**

Surface of 3rd mound, E94N98, E96N98.

550 ± 50

Tx-1533. Hays 234-2, Third Mound **AD 1400**

Cane charcoal; same location as Tx-1532.

520 ± 50

Tx-1537. Hays 231-2, Third Mound **AD 1430**

Cane charcoal, same location as Tx-1532.

Comment on Third Mound dates: continuity of ceramics within site does not indicate appreciable time lapse between 2nd and 3rd mounds, so that Tx-1528 appears most likely correct date in light of dates from earlier stages. Cane charcoal dates Tx-1533, -1537 may be late due to fractionation during photosynthesis (Bender, 1968), although these dates agree with wood charcoal Tx-1532.

Crenshaw site series, Arkansas

Wood charcoal samples (except as noted) from Crenshaw site (3MI6) W side Red R 29km NE of Texarkana, SW Arkansas (33° 28′ N, 93° 45′ W). Late component, in Area 1, is early Caddoan; earlier component, in Area 4 and Mound F, is late Fourche Maline. Coll 1968, 1969, subm and commented on by Frank Schambach, Arkansas Archaeol Survey, Southern State Coll, Magnolia, Arkansas.

Tx-1351. Crenshaw 370-a **850 ± 50** **AD 1100**

Area 1 midden; from distinct layer at bottom of Feature 11, pit hearth. *Comment*: too recent compared with Tx-1352 and Tx-1353 from same feature, and with rest of series.

Tx-1352. Crenshaw 378-a **950 ± 50** **AD 1000**

Area 1 midden; Feature 11, higher layer than Tx-1351.

Tx-1353. Crenshaw 378-b **940 ± 50** **AD 1010**

Same as Tx-1352, but small particles of charcoal, twigs, and bark.

Tx-1355. Crenshaw 596 **520 ± 60** **AD 1430**

Deer bone; Area 1, Feature 6, ash-laden floor. *Comment*: does not fit with rest of Area 1 features.

Tx-1356. Crenshaw 599 **960 ± 60** **AD 990**

Area 1, Feature 6, charcoal scattered throughout house floor.

Tx-1359. Crenshaw 597 **790 ± 270** **AD 1160**

Deer bone; Area 1, Feature 6, a house, from beneath floor. Large error due to small sample size. *Comment*: see Tx-1361, below.

Tx-1360. Crenshaw 298-a **970 ± 60** **AD 980**

Area 1, Feature 9, pit hearth.

Tx-1698. Crenshaw 298-b **830 ± 70** **AD 1120**

Same as Tx-1360, but pine cone fragments. *Comment*: experimental run to check isotopic fractionation in pine cones; 140 to 170 yr more recent than wood charcoal in same context.

Tx-1361. Crenshaw 598 **790 ± 70** **AD 1160**

Deer antler; Area 1, Feature 1, pile of antler assoc with floor of Feature 6. *Comment*: date agrees with age of Feature 6 (Tx-1359, above) as expected.

1060 ± 60

Tx-1354. Crenshaw 421-a **AD 890**

Area 4 midden, Feature 12, pit hearth. *Comment*: substantially more recent than estimated range, AD 600 to 800, for late Fourche Maline occupation.

890 ± 50

Tx-1358. Crenshaw 421-b **AD 1060**

Same as Tx-1354, but bark, twigs, and pine cone fragments. *Comment*: see Tx-1698, above.

1050 ± 70

Tx-1357. Crenshaw 595-a **AD 900**

Mound F, midden layer above clay cap over mass grave under mound.

General Comment: Caddo culture began in this area between late Fourche Maline and early Caddo occupations of this site, dates for which overlap in 10th century. Area 1 dates agree with those from other early Caddo sites, such as Davis (R, 1970, v 12, p 626-629, and present date list) and Harlan (*ibid*, p 254-258). Deer bone and antler from Area 1 are more recent than other samples, possibly reflecting fractionation in grasses eaten by deer.

Nevada, Utah, Alabama

Thompson Site series, Nevada

Charcoal from Thompson site (26WA1435), E side of Steamboat Creek, 2km SSE of junction Hwys 17 and 395, S of Reno, Nevada (39° 23′ N, 119° 43′ W). Site has 5 stratigraphic units, D (lowest) through H. In F1 (lower part Unit F), is midden ("Steamboat component") with lanceolate projectile points, chipped stone drills, manos, metates. Soil III, a structural and weak textural B horizon, later than Steamboat component, is developed in F2, upper part of F. Unit G, overlying F, is eolian deposit with artifacts and features suggesting dates during last 300 to 500 yr. Coll 1971 by R Elston and J O Davis; subm by Robert Elston, Nevada Archeol Survey, Univ of Nevada, Reno.

330 ± 60

Tx-1390. Thompson, 28 **AD 1620**

From hearth, Feature 1, on unconformity between Soil III and Unit G. No direct cultural assoc.

3480 ± 110

Tx-1391. Thompson, 2 **1530 BC**

Composite sample, particles scattered through Unit F, both F1 and F2.

General Comment (RE&JOD): dates indicate Steamboat component is early phase of Early Martis complex (Elston, 1971) and that local rate of clay accumulation and structural development in Soil B horizons is more than twice that of regional estimates in current literature (Birke-

land, 1965; Mock, 1972). Dates bracket period of weathering during which weak textural and moderate structural B horizon formed.

Dust Devil Cave series, Utah

Samples from Stratum IV (except as noted), Dust Devil Cave (NA 7613), 12km NE of summit of Navajo Mt, San Juan Co, S Utah (37° 07′ N, 110° 47′ W). Site has 2 major cultural strata: Stratum IV (lower) with Desha complex materials; Stratum VI with Basketmaker II and Pueblo II-III materials. BMII occupation has ^{14}C date of 1820 ± 80 (Tx-452; R, 1970, v 12, p 276). Earlier work at site reported in Lindsay *et al*, 1968, p 102-121. Coll 1970, subm and commented on by J R Ambler, Dept Anthropol, Northern Arizona Univ, Flagstaff, Arizona. Samples are listed in stratigraphic order, top to bottom.

Tx-1260. Dust Devil IV, 1 **6840 ± 130**
4890 BC

Sandal fragments, Sq F9, top of stratum.

Tx-1261. Dust Devil IV, 2 **6740 ± 110**
4790 BC

Charcoal from Hearth 35, Sq F9, top of stratum.

Comment on Tx-1260, -1261: dates agree, indicate Desha complex lasted 200 yr later than 7000 BP indicated by Sand Dune Cave dates (Tx-447, -448, -454; R, 1970, v 12, p 276-277).

Tx-1262. Dust Devil IV, 3 **7630 ± 120**
5680 BC

Human fecal material, Sq B7, middle portion of stratum. *Comment*: in terms of stratigraphic position, consistent with other dates in series.

Tx-1263. Dust Devil IV, 4 **7340 ± 100**
5390 BC

Charcoal from concentration in Sq G8, middle part of stratum. Sample split and 2 parts prepared and counted separately: 7460 ± 120, 7210 ± 170. *Comment*: inconsistent stratigraphically with Tx-1264, but consistent with series as a whole.

Tx-1264. Dust Devil IV, 5 **7250 ± 110**
5300 BC

Charcoal from Hearth 37, Sq F9, bottom of stratum. *Comment*: earliest Desha complex, unless Tx-1265, -1266 are Desha.

Tx-1265. Dust Devil IV, 6 **8370 ± 110**
6420 BC

Charcoal from Hearth 32, Sq F8, bottom of stratum. Sample was split and 2 parts prepared and counted separately: 8380 ± 130, 8360 ± 180.

Tx-1266. Dust Devil IV, 7 **8830 ± 160**
6880 BC

Yucca leaves from Feature 17, yucca-lined pit, within Stratum III but dug from surface at base of Stratum IV.

Comment on Tx-1265, -1266: beginning of cave occupation; either earliest Desha complex (before Tx-1264) or a separate, earlier occupation.

9600 ± 150

Tx-1267. Dust Devil III, 8 **7650 BC**

Leaves of Gambel's Oak and hackberry, Sq F8, Stratum III. Leaves blew into site before Desha complex occupation. Should provide *terminus post quem* for that occupation. *Comment*: with Tx-1266, indicates 800-yr hiatus between deposition of stratum III and beginning of occupation.

Winston County Shelter #23 series, Alabama

Fragmentary human bones from burial in Square 25, 91 cm depth, Winston County Bluff Shelter #23, 18km NE of Jasper, Alabama (34° 00′ N, 87° 15′ W). Burial was assoc with fireplace, and appeared disturbed. Also assoc were projectile points of early Archaic types. Coll and subm by Karen Joines, Samford Univ, Birmingham, Alabama.

4850 ± 60

Tx-1614A. Winston #23, apatite **2900 BC**

2650 ± 550

Tx-1614B. Winston #23, collagen **700 BC**

General Comment (KJ): apatite date agrees closely with archaeologic estimate of site age; (SV, EMD) collagen evidently affected by recent organic carbon.

Mexico, Peru

Fábrica San José series, Oaxaca, Mexico

Wood charcoal from Fábrica San José site, 13km NNE of Oaxaca, Mexico (17° 11′ 03″ N, 96° 40′ 20″ W). Site is one of few Middle Formative sites in piedmont zone of Valley of Oaxaca. Coll 1972 by R D Drennan and subm by D M Varner, Texas Memorial Mus, Univ Texas, Austin.

2460 ± 80

Tx-1699. Fábrica San José #21 **510 BC**

Layer of ash and charcoal in basin-shaped hearth. Ceramics are Monte Alban IA phase.

2670 ± 60

Tx-1700. Fábrica San José #14 **720 BC**

In layer of burned daub immediately above house floor. Ceramics are Monte Alban IA phase.

3110 ± 80

Tx-1701. Fábrica San José #26 **1160 BC**

Layer of ash and charcoal in bottom of basin-shaped hearth in packed sand house floor. Sealed under later house floor. Ceramics in both floors are early Guadalupe phase.

2350 ± 20

Tx-1702. Fábrica San José #22 **400 BC**

Layer of ash and charcoal in bottom of basin-shaped hearth. Ceramics are Monte Alban I phase.

General Comment (DMV): dates clarify beginning and duration of Guadalupe and Monte Alban IA phases during which settlement patterns shifted from valley floor alone to piedmont zone as well.

Pashash series, Peru

Charcoal samples from Pashash site, 2km SW of Cabana, Prov de Pallasca, Ancash, Peru (8° 24′ S, 78° 03′ W). Coll 1969 & 1971, subm and commented on by Terence Grieder, Dept Art, Univ Texas, Austin.

1500 ± 90

Tx-940. Pashash A **AD 450**

NE corner El Caseron; Cut 3, Level 2, 80 to 100cm. Assoc with richest level of Huaylas, or Recuay, pottery. Dates domestic construction after colossal fortification walls. *Comment*: date plausible, and agrees with Tx-942 (below) as it should, but in reverse sequence with Tx-943 (below) suggesting redeposition of slope wash on small structures flanking El Caseron.

1490 ± 70

Tx-941. Pashash B **AD 460**

From cut in Huaylas house W of La Capilla; Cut 4, Level 1, 40cm below surface. Burned roof beams of next-to-last house construction at this spot. Early Huaylas pottery, before resist was common. This sample should date a conquest of the site. A final building phase follows it. *Comment*: in proper sequence with Tx-944, -1322.

1580 ± 70

Tx-942. Pashash C **AD 370**

NE corner El Caseron; Cut 3, Level 2, lower part, ca 130 to 150cm. Assoc with beginning of richest sample of classic Huaylas or Recuay pottery and houses after building of colossal fortification walls. Dates resist pottery decoration and Huaylas pottery style. *Comment*: see Tx-941, above.

1380 ± 100

Tx-943. Pashash D **AD 570**

NE corner El Caseron; Cut 3, Level 4, 200 to 235cm. Dates beginning of later walls, later than colossal fortification walls. Before major period of resist painting on pottery, although resist was in use. *Comment*: see Tx-941, above.

1640 ± 80

Tx-944. Pashash E **AD 310**

Cut 4 (see Tx-941, above) 80cm below surface, under Floor 2. Dates 1st floor in this house laid down in Huaylas (Recuay) times; end of Chavinoid pottery and beginning of Huaylas (Recuay) style. Dates

beginning of houses; post-dates colossal fortification walls. Should be oldest sample of this series (but site has prior occupations). *Comment*: appropriately early relative to other dates in series, but surprisingly late for end of Chavinoid. See also Tx-1332, below.

1400 ± 60

Tx-1329. Pashash F **AD 550**

Cut 10, Level 4, against top of S wall of La Capilla hill inside chamber. Dates offering of stone pedestal bowls, Recuay effigy pottery, copper bells, and megalithic revetment wall.

420 ± 80

Tx-1330. Pashash G **AD 1530**

Cut 7, 50cm W of La Portada, Level 4, 180cm deep. Dates Recuay ceramics.

1110 ± 270

Tx-1331. Pashash H **AD 840**

Cut 9, top of La Capilla hill, against N wall, Level 2, 35cm below stone floor. Dates red-on-white ceramics. *Comment*: fill must be mixed; date too recent for red-on-white, even at early end of 1σ range.

1610 ± 170

Tx-1332. Pashash I **AD 340**

Cut 9 (see Tx-1331), Level 3. Dates initial occupation with pre-Recuay, red-on-white, and terminal Chavin ceramics. *Comment*: agrees with Tx-944 above, but—like that date—surprisingly late for terminal Chavin.

Ecuador

Samples coll 1970 (except as noted) and subm by R E Bell, Dept Anthropol, Univ Oklahoma, Norman.

Alangasi Mastodon Locality series, Ecuador

Wood from Alangasi Mastodon Locality, just N of Alangasi, Ecuador (0° 18′ S, 8° 1′ W). A mastodon skeleton with evidence of burning and assoc obsidian flakes and pottery sherds was found here in the 1920's (Uhle, 1928). Precise location of mastodon skeleton no longer certain; believed to have been in same stratigraphic unit as these samples —Late Cangagua, volcanic ash deposit of widespread occurrence around Mt Ilalo. Tx-1126-1130 from Site #1, 5m or more deep in side of gully; Tx-1131 from Site #2, about 60m downstream from Site #1, 8 to 10m deep. Errors are 2σ.

Tx-1126. Alangasi 1, A **>38,000**

Tx-1127. Alangasi 1, B **>40,000**

36,750 ± 2540

Tx-1128. Alangasi 1, C **34,800 BC**

Tx-1129. Alangasi 1, D **>40,000**

Tx-1130. Alangasi 1, E **39,560 ± 7200**
37,610 BC

Tx-1131. Alangasi 2 **39,100 ± 6820**
37,150 BC

General Comment (REB): dates older than expected for mastodon and much too old for artifacts, but will help in using Late Cangagua as time marker in area. Mastodon either not contemporary with cangagua or not in primary assoc with artifacts, or both. Mastodon discovery evidently needs reevaluation.

Shobschi Cave series, Ecuador

Charcoal from preceramic horizon, Shobschi Cave, near Sigsig, Prov Azuay, Ecuador (3° 2′ S, 78° 57′ W). Coll 1968 by G Reinosa Hermida.

Tx-1132. Shobschi, A **8480 ± 200**
6530 BC
From 10cm below surface.

Tx-1133. Shobschi, B **10,010 ± 430**
8060 BC
From 20cm below surface.

General Comment (REB): dates indicate Shobschi is important preceramic site and merits further excavation. Cultural deposit continues below older sample.

Santi Lucia series, Ecuador

Charcoal scraped from pottery vessels from graves exposed by weathering at Santa Lucia site (ED-16), near Tumbaco, Ecuador (0° 15′ S, 78° 26′ W). Vessels are of typical Panzaleo ware, common and widespread in Highland area around Quito.

Tx-1134. Santa Lucia, Burial #1 **2060 ± 110**
110 BC

Tx-1135. Santa Lucia, Burial #2 **2170 ± 100**
220 BC

General Comment (REB): these are 1st dates for Panzaleo ceramics, and will provide initial point of reference in study of ceramic sequence in area.

Tx-1136. Rubia Cocha #2, Ecuador **170 ± 70**
AD 1780

Charcoal from buried fireplace exposed in side of ditch cut, 10 to 25cm below surface, in Rubia Cocha #2 site (ED-4), near Tumbaco (0° 15′ S, 78° 28′ W). Field evidence not certain whether fireplace was assoc with Panzaleo ceramics or with preceramic occupation, or represented recent charcoal preparation subsequently covered by colluvium. *Comment* (REB): sample evidently from recent charcoal industry.

Stobi series, Yugoslavia

Charcoal (except where noted) from Stobi, Hellenistic and Roman site at junction of Crna R with Vardar R, S of Titov Veles, Macedonia, Yugoslavia (41° 33′ N, 21° 59′ E). As noted, most samples were split and check-dated by this lab and Rudjer Bošković lab at Zagreb; Zagreb dates pub in R, 1973, v 15, p 438-439. Most samples also were split by us and the 2 parts prepared and dated separately; in these cases individual dates are given. Except where noted, samples coll 1971 by hand, stored in polyethylene bags. Coll and subm by J R Wiseman, Dept Classics, Boston Univ, Boston, Mass, and E M Davis. Comments by EMD; for more extended discussion, see Davis *et al*, 1973.

1600 ± 60

Tx-1339. Stobi R-71-3; Episcopal Basilica AD 350

Episcopal Basilica, S Stairway, W extension; above steps 2, 3, 4 of S Stairway, alt 146.89 to 147.39m. Later than final destruction of building. Date is average: 1610 ± 100, 1550 ± 100. Same sample as Z-207, 1611 ± 69. *Comment*: agrees closely with Z-207, and with archaeologic date of ca AD 400 for construction of building; early for late 6th century date of destruction.

1660 ± 130

Tx-1340. Stobi R-71-13; Episcopal Basilica AD 290

Wood; Episcopal Basilica, S Stairway, E extension 5; W of Wall 9, S of Wall 2, E of Wall 5; alt 144.39 to 144.69m. Below destruction fill, above latest floor; relates to latest use of basilica. *Comment*: within 1σ of archaeologic date of building construction.

1540 ± 70

Tx-1347. Stobi R-71-37; Episcopal Basilica AD 410

Episcopal Basilica, S Stairway, NE area of E ext 5; from Wall 5 to and beyond Wall 13. Burned timber from final layer of destruction fill in this area above latest earth floor; alt 143.37 to 143.98m. Date is average: 1490 ± 70, 1580 ± 70. Same sample as Z-205, 1619 ± 66. *Comment*: agrees with Z-205, and with archaeologic date of building construction.

1680 ± 70

Tx-1348. Stobi R-71-38; Episcopal Basilica AD 270

Episcopal Basilica, Baptistry; from deposit above NE and NW parts of mosaic floor encircling piscina; alt 143.15 to 143.39m. Same sample as Z-211, 1759 ± 61. *Comment*: agrees well with Z-211; earlier than archaeologic date of building construction.

General Comment on Tx-1339, -1340, -1347, -1348: later part of date ranges mostly agree with AD 400 construction date of Episcopal Basilica, but as a group dates suggest early to middle 4th century rather than late 4th to early 5th. Presumably we are dating inner rings of beams.

1760 ± 40

Tx-1341. Stobi R-17-14A; W Cemetery AD 190

W Cemetery, S trench, N & E parts; from zone resting on Wall 8, alt 148.97 to 149.22m, with abundant pottery of 1st and 2nd centuries AD. Stored damp in polyethylene bag for 3 weeks, then dried. Date is average: 1680 ± 70, 1770 ± 70. Same sample as Z-216, 1779 ± 66. *Comment*: agrees with Z-216 and with ceramic date.

2060 ± 120

Tx-1154. Stobi MF-70-44; W Cem, Grave 21 110 BC

Vegetal materials from W part Grave 21; part of burial offering including terracotta figurines and bas reliefs, unguentaria, pottery. Archaeologic date 30 BC to AD 40. Coll 1970. *Comment*: see below, Tx-1342.

1810 ± 60

Tx-1342. Stobi R-71-15; W Cem, Grave 21 AD 140

Nuts from E part of same grave as Tx-1154. Wrapped in tissue, placed in polyethylene bag; tissue removed 3 weeks later. Date is average: 1770 ± 80, 1850 ± 90. Same sample as Z-213, 1836 ± 48. *Comment*: Tx-1342 and Z-213 agree but are a little later than archaeologic date, whereas Tx-1154 is anomalously early.

1810 ± 70

Tx-1344. Stobi R-71-34; W Cem, Grave 82 AD 140

Fill of Grave 82, archaeologic date early 1st century AD. Date is average: 1810 ± 100, 1810 ± 100. Same sample as Z-210, 1883 ± 72. *Comment*: agrees with Z-210 and with archaeologic date.

1640 ± 50

Tx-1345. Stobi R-71-35; W Cem, Grave 57 AD 310

Fill of Grave 57, probably 1st century AD. Date is average: 1600 ± 70, 1670 ± 70. Same sample as Z-206, 1877 ± 65. *Comment*: does not agree with Z-206 or with archaeologic date; reason for discrepancy not apparent.

1620 ± 50

Tx-1343. Stobi R-71-33; Fuller's House AD 330

House of the Fuller; charred beam in destruction layer on highest of 4 floors; final destruction of building; alt 149.19 to 149.66m. Ceramics late 4th century AD. Coll by hand into tray, moist; transferred to polyethylene bag, left open for 6 weeks in basement lab. Date is average: 1650 ± 60, 1590 ± 70. Same sample as Z-212, 1769 ± 69. *Comment*: does not agree with Z-212: late part of range agrees with ceramic date.

1530 ± 50

Tx-1346. Stobi R-71-36; Acropolis AD 420

Acropolis, Trench 1, from destruction debris in Room 4; probably roof beam. Should date end of last occupation in this part of site. Ceramics and coins indicate 5th or possible 6th century AD. Date is

average: 1540 ± 70, 1520 ± 70. Same sample as Z-215, 1619 ± 65. *Comment*: agrees with Z-215 and with archaeologic date.

Tx-1349. Stobi R-71-23; bridge **130 ± 40** **AD 1820**

Bridge Access; wood from transverse slot in pavement leading up from Pier I, W abutment pier of former bridge across Crna R. Should date bridge construction. No archaeologic date for bridge; stratigraphically later than flood-plain terrace-fill, which is later than ruins of wall built no later than 5th century AD. Coll with trowel and forceps. Date is average: 130 ± 60, 120 ± 60. *Comment*: date indicates bridge is Turkish, not Roman.

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