

## UNIVERSITY OF TEXAS RADIOCARBON DATES III

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This list reports measurements made at this laboratory since the preparation of the last list (Texas II). About twenty measurements are not reported because they are from series which are incomplete. Ages were calculated using a  $C^{14}$  half-life of 5568 yr and 1950 as the reference year. The modern standard used was 95% of NBS oxalic acid activity. The deviations reported are based on the counting statistics of the sample, background, and modern, and are  $\pm 1\sigma$  except that when the sample count approached either the modern standard or the background,  $2\sigma$  limits are reported.

The laboratory continues to use liquid scintillation counting of benzene as described in Texas II. In the past year, several other laboratories using this method have begun making measurements and several inter-laboratory check samples have been run and are reported below. In collaboration with the Caracas IVIC laboratory, a study was made of possible non-statistical errors, such as non-reproducible isotope fractionation in the benzene synthesis (Tamers and Pearson, 1965). This study lends support to our previous conclusion (Texas II, p. 139) that isotope fractionation in the benzene synthesis, if present at all, amounts to less than 1% and probably to less than  $1/2\%$ , which is insignificant for purposes of  $C^{14}$  dating.

## ACKNOWLEDGMENTS

We would like to thank the Packard Instrument Co. of La Grange, Illinois, for the loan of the counter with which most of these measurements were made, and the Texas Archeological Salvage Project for its contribution to the support of this laboratory. Technical assistance in the preliminary treatment of samples was provided by James Crowhurst. We are especially grateful to Miss Jo Anne Nowick for her very able assistance in laboratory administration and preliminary sample processing.

## I. CHECK SAMPLES

Texas Number	Texas Date	Other Number	Other Date	Reference
Tx-157	7740 $\pm$ 170	PIC-5	8080 $\pm$ 165	Packard I
Tx-158a	9500 $\pm$ 200			
Tx-158b	9320 $\pm$ 160	} IVIC-151	9470 $\pm$ 180	M. A. Tamers, written commun.
Ave	9410 $\pm$ 130		PIC-6	
Tx-159	8970 $\pm$ 150	PIC-3	8900 $\pm$ 200	Packard I
Tx-161	<160	USDA-15	160 $\pm$ 100	L. L. McDowell, written commun.
Tx-188	800 $\pm$ 90	IVIC-18	790 $\pm$ 100	IVIC I
Tx-189	610 $\pm$ 95	IVIC-62	690 $\pm$ 110	IVIC I
Tx-190a	1200 $\pm$ 110			
Tx-190b	1100 $\pm$ 110			
Ave	1150 $\pm$ 75	IVIC-74	1340 $\pm$ 95	IVIC I

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In addition, two other samples elsewhere in the present date list have been dated by other laboratories: Mineral Springs, Tx-111; Mitchell Site log, Tx-198.

II. GROUND WATER SAMPLES

The following measurements are on carbonate dissolved in ground water from wells in the Carrizo Sand in Atascosa and surrounding counties, south-central Texas. These measurements are being used to test the validity of a technique proposed by Ingerson and Pearson (1964) which uses C<sup>13</sup>/C<sup>12</sup> ratios to correct C<sup>14</sup> ages of materials diluted by dead, limestone-derived carbon. The results of the completed study will be presented later.

Samples coll. late summer and fall of 1963 and spring of 1964 and subm. by Pearson. The δC<sup>13</sup> values reported were determined by Dr. Irving Friedman of the U. S. Geol. Survey, and are relative to the P.D.B. standard. The δC<sup>13</sup> values given for those samples listed in Texas II were consistently 0.6‰ more negative than those determined by Dr. Friedman. For consistency and completeness, these samples, Tx-90 through Tx-97, are reprinted here with the corrected values of δC<sup>13</sup>. Those values given in parentheses were not determined specifically by Dr. Friedman; they are last year's values with 0.6‰ added.

Part of this work was supported by a Univ. of Texas Research Inst. grant to Dr. Earl Ingerson. We are especially grateful to Dr. Friedman for the δC<sup>13</sup> determinations.

Number	Owner Well number	N Lat	W Long	δC <sup>13</sup> -‰	C <sup>14</sup> -‰ of modern
<i>Atascosa County</i>					
Tx-90	M. W. Parchman AL-6851-803	29°08'	98°41'	-18.9	76.9 ± 1.0
Tx-91	R. L. Bruce estate AL-6860-302	29°07'	98°31'	(-18.5)	74.9 ± 0.7
Tx-92	Alex Ross AL-6859-504	29°03'	98°41'	-17.9	50.1 ± 0.7
Tx-210	T. B. Mallard AL-7802-301	28°58'	98°46'	-11.5	33.6 ± 0.4
Tx-93	City of Pleasanton AL-7805-104	28°58'	98°29'	-11.8	17.1 ± 0.4
Tx-94	Joe J. Vylvlecka AL-7812-201	28°51'	98°34'	(-9.9)	6.92 ± 0.41
Tx-211	Texaco, Inc. AL-7810-602	28°49'	98°45'	-4.5	2.30 ± 0.50
Tx-96	Gulf Oil Co. AL-7815-504	28°48'	98°10'	(-15.0)	2.54 ± 0.20
Tx-226	Lincoln Hoger AL-7818-301	28°43'	98°46'	-8.8	6.38 ± 0.25
Tx-216	T. E. Peeler AL-7820-101	28°44'	98°36'	-11.7	3.69 ± 0.14
Tx-214	City of Corpus Christi AL-7822-201	28°45'	98°18'	-9.8	1.36 ± 0.10
<i>La Salle County</i>					
Tx-215	Jess McNeel RX-7822-801	28°32'	98°49'	-9.1	2.06 ± 0.13

Number	Owner Well number	N Lat	W Long	$\delta C^{13}\text{-}\%$	$C^{14}\text{-}\%$ of modern
<i>Live Oak County</i>					
Tx-97	Humble Oil Co. A-4	28°40'	98°11'	(-3.7)	1.19 ± 0.17
<i>McMullen County</i>					
Tx-217	Claude Franklin SU-7828-101	28°36'	98°36'	-9.5	1.17 ± 0.09
Tx-218	City of Tilden SU-7836-201	28°28'	98°33'	-10.7	<0.62
Tx-219	J. T. Calliham SU-7838-101	28°29'	98°21'	-10.6	<0.66
<i>Wilson County</i>					
Tx-95	J. T. Harris J-5	28°57'	98°15'	-13.4	2.63 ± 0.28

## III. GEOLOGIC AND PALEONTOLOGIC SAMPLES

## A. Gulf Coast

**Laguna Madre Beach series**

Beach rock and shells from Laguna Madre near Carvajal, Tamaulipas, Mexico (24° 30' N Lat, 97° 45' W Long), dated to determine whether features sampled are result of recent or Pleistocene marine processes. Coll. 1964 and subm. by E. W. Behrens, Inst. of Marine Science, Univ. of Texas, Port Aransas, Texas. Comments by E.W.B.

**Tx-154. Laguna Madre Beach CD-1** **2340 ± 100**  
**390 B.C.**

Fossil beach shells (*Busycon*, *Macrocallista*, *Polinices*, *Fasciolaria*, and *Dinocardium*) from ca. 8 ft above sealevel in a bluff on NE shore of Bahia Salada near point where bay enters Laguna Madre. Shells appear little weathered; they are slightly worn but many retain original color markings. *Comment*: the high stand of sealevel implied by date correlates with "Abrolhos Terrace" of Fairbridge (1958). Because specimens used are not bay species but live only in the open Gulf, the present island is dated as well as the beach deposit from which shells were collected.

**Tx-155. Laguna Madre Beach CD-2** **35,200 +2400**  
**-1800**  
**33,250 B.C.**

Beach rock from within a marine sand ca. 3 ft above sealevel on NE shore of Bahia Salada 3 mi from the point of connection of the bay with Laguna Madre.

**Tx-156. Laguna Madre Beach CD-3** **24,900 ± 700**  
**22,950 B.C.**

From Punta Piedras, a body of beach rock projecting into Laguna Madre approx. at sealevel. Beach rock projects from a marine sand at same level as, but discontinuous with, Tx-155, above.

*Comment on Tx-155 and Tx-156*: Tx-155 contains three types of calcium carbonate: original marine mollusc shell (12%), sparry calcite cement (34%),

and grain growth calcite replacing shell material (26%). First two types are probably penecontemporaneous, and their age is the age of formation of the beach rock and thus dates sealevel. However, third type may be younger and thus make the date too young. It is too abundant (26%) to be Recent, though, so the date may yet be credible. Tx-156 is similar to Tx-155 except that a fourth type of carbonate (stromatolitic balls and coatings) is present and may cause the date to be too young. In any case, Tx-155 and Tx-156 are samples of beach rock deposited during Pleistocene rather than Recent, and dates may represent Sangamon Stage.

### Laguna Madre Reef series

Samples of serpulid reef rock from Laguna Madre. These reefs are now extinct and were dated to determine when ecological conditions were such as to allow reef development (Andrews, 1964). Coll. 1964 and subm. by P. B. Andrews, Univ. of Texas, Austin.

**Tx-221. Laguna Madre Reef LOSR-1** **345 ± 130**  
A.D. 1605

From irregular patch reef almost completely buried by sediment in center of Laguna Salada, 2 mi W of Riviera Beach (27° 16.5' N Lat, 97° 41.5' W Long). Water depth over reef 1.5 to 2.0 ft.

**Tx-222. Laguna Madre Reef ASR-1** **<260**

From irregular patch reef partly buried by sediment S of Starvation Pt at mouth of Alazan Bay (27° 16' N Lat, 97° 33' W Long). Water depth over reef 2.5 to 4.5 ft.

**Tx-223. Laguna Madre Reef BB103-1** **<260**

From single, almost circular reef (BB103) at mouth of Baffin Bay at W edge of intracoastal canal SW of buoy 103, USCGS Chart 894 (27° 18.6' N Lat, 97° 24.3' W Long). Sample from lowest of three layers of worm tubes in large single specimen from upper 12 in. of S face of reef. Upper 6 to 12 in. of reef exposed at low tide.

**Tx-224. Laguna Madre Reef BB103-2** **<225**

Middle layer of specimen described above (Tx-223).

**Tx-225. Laguna Madre Reef BB103-3** **<180**

Upper layer of specimen described above (Tx-223).

*Comments on Laguna Madre Reef series* (F.J.P.): these samples have a large surface-area to volume ratio and, being intertidal or near surface, were subjected to alternating submersion and exposure to the atmosphere. These factors were found by Samos (1949) to promote maximum isotope exchange between solid carbonate and CO<sub>2</sub> gas. Dates may therefore be anomalously young, by a factor which probably does not exceed 500 yr (Samos, 1949; Olson, 1963, fig. 3). (P.B.A.): a core in reef BB103 shows that only a thin (9 in.) layer of sediment has been deposited since reef first formed, so ages given may be real. Analysis of foraminifers from bottom core in center of Baffin Bay may prove or disprove them.

*B. Finland*

One sample from Finland, Tx-125, is listed under "Archaeologic Samples."

**Tx-126. Viljakkala**

**6620 ± 120**  
**4670 B.C.**

Mud (primarily coarse detritus) from depth of 2 m in the profile at Lake Karhejarvi, near Viljakkala, Karhe, Finland (ca. 61° 45' N Lat, 23° 30' E Long). Sample represents occurrence of *Trapa natans* L. during postglacial development of Lake Karhejarvi. Coll. 1962 and subm. by P. Alhonen, Dept. of Geol. and Palaeol., Univ. of Helsinki, Snellmanink, Helsinki. *Comment* (P.A.): age is very suitable and reasonable.

**Tx-127. Herttoniemi Mammoth bone**

**9030 ± 165**  
**7080 B.C.**

Mammoth bones, two pieces of humerus dx., found between clay and sand under the bog near Herttoniemi, Helsinki, Finland, depth 1.2 m (60° 12' N Lat, 25° 00' E Long). First mammoth bone from Finland to be submitted for C<sup>14</sup> dating. According to pollen analysis, the bone is late-glacial, but the location may be secondary. Coll. 1954 by O. Kalela and M. Salmi, Geol.-Paleo. Inst., Univ. of Helsinki. Sample was split and C<sup>14</sup> measurements made on the residue after the portions were dissolved in HCl. Individual dates were 9140 ± 290 and 8920 ± 165. *Comments* (M.S.): age in question seems much too young. (F.J.P.): bone ages, even those determined on acid insoluble residues, are often younger than the age of equivalent charcoal (Tamers and Pearson, in preparation). Thus, this date should be considered a younger limit to the true age.

*C. Alaska***Tx-220. Nerrarak Slough**

**6450 ± 200**  
**4500 B.C.**

Wood from BIA hole #4 in a series of estuarine sediments containing near-shore shallow-water fauna underlying Nerrarak Slough (71° 12' N Lat, 156° 40' W Long), between Barrow and Browerville, Alaska. BIA hole #4 is 800 ft SE of present shoreline; wood fragments dated obtained from sludge adhering to tip of drill bit. Hole bottomed at 36.5 ft below sealevel; wood presumably came from interval of -34 ft to -36.5 ft as hole was cleaned at 2.5 ft intervals. Coll. May 1962 and subm. by R. W. Faas, Dept. of Geol. and Geog., Lafayette College, Easton, Pennsylvania. *Comment* (R.W.F.): date should indicate time of small post-Pleistocene rise in sealevel (Faas, 1964).

*D. Western Australia***Tx-32. Swan River Bore 32, Perth**

**8340 ± 180**  
**6390 B.C.**

Charred wood from 72 to 74 ft below mean sealevel, Bore 32 (55M409) at site of Narrows Bridge, Swan River, Perth, Western Australia (31° 57' S Lat, 115° 51' E Long). Specimen was at level of a change from clastic sediments to soft organic mud containing recent marine shells. Two other samples from deeper in same bore have been dated by Humble (0-644, 80 ft, 10,800 ±

30; 0-640, 100 ft,  $11,075 \pm 240$ ; J. Lundelius, oral communication). Other samples from Swan River have been published in a previous date list as "Perth Series" (Texas II, p. 143-144). Coll. 1955 and subm. by Judith Lundelius, Austin, Texas. *Comment* (J.L.): position of sample coincides with appearance of modern marine fauna in this bore. Relationship to deeper samples dated by Humble suggests possibility of discontinuity or change in rate of sedimentation earlier than the present sample. Date from upstream at New Causeway Bridge, 60 ft deep (Tx-52,  $8270 \pm 170$ ; Texas II), agrees with this one; difference in depth may reflect stream gradient.

#### IV. ARCHAEOLOGIC SAMPLES

##### A. Amistad Reservoir, Texas

The following samples have been obtained in the course of archaeological salvage and associated work in the Amistad Reservoir area, on the Rio Grande and its tributaries in the vicinity of the mouth of the Pecos R, Val Verde County, Texas. A summary of the Amistad sequence is given in a previous date list (Texas II, p. 151). References for diagnostic point types mentioned below are: Val Verde (Schuetz, 1956, p. 141); "Early Barbed," not a type but a preliminary broad grouping (Johnson, 1964, p. 33); all others (Suhm *et al.*, 1954, and Suhm and Jelks, 1962). All samples subm. by C. D. Tunnell, Texas Archeol. Salvage Project, Univ. of Texas, Austin.

##### Eagle Cave series

Samples from Eagle Cave (41 VV 167), an important stratified site in Mile Canyon near Langtry ( $29^{\circ} 49' N$  Lat,  $101^{\circ} 33' W$  Long). The six strata recognized in the deposit had the following diagnostic characteristics: Stratum I (most recent), disturbed by recent vandalism; Stratum II, with substrata in which Pandale, Langtry, and Val Verde points occurred in differing frequencies; Stratum III, expanding-stem notched-base points, unnamed as yet; Stratum IV, a massive accumulation of burned limestone fragments, no diagnostic artifacts; Stratum V, earliest occupation of the site, "Early Barbed" points; Stratum VI (deepest), sterile roof spalls. One previous  $C^{14}$  date from the site,  $4550 \pm 130$  from "Zone B" (0-137; Schuetz, 1957, p. 288), derives from excavation done in the 1930's, and it has not been possible to equate "Zone B" with any of the strata listed here. Coll. 1963 by R. E. Ross, M. L. Parsons, and C. D. Tunnell; comments by C. D. T. and R. E. R. Samples are grouped below by stratum, from deepest to shallowest. All are charcoal.

<b>Tx-107. Eagle Cave A</b>	<b><math>8760 \pm 150</math></b>
From Stratum V, Hearth 1.	<b>6810 B.C.</b>
<b>Tx-108. Eagle Cave B</b>	<b><math>8680 \pm 150</math></b>
From Stratum V, Hearth 2.	<b>6730 B.C.</b>
<b>Tx-109. Eagle Cave C</b>	<b><math>6640 \pm 120</math></b>
Scattered charcoal fragments from Stratum V, collected on the screen.	<b>4690 B.C.</b>

**Tx-140. Eagle Cave 239** **8540 ± 120**  
**6590 B.C.**

From Stratum V, Sq. N85/W70. Average of 2 determinations: 8640 ± 170 and 8440 ± 170.

**Tx-141. Eagle Cave 187** **8760 ± 150**  
**6810 B.C.**

From Stratum V, Sq. N95/W90.

**Tx-197. Eagle Cave 230** **8680 ± 180**  
**6730 B.C.**

From Stratum V, Sq. N95/W85.

*Comment on samples from Stratum V:* five of these six samples are in close agreement, dating the first occupation of the site in earlier part of 7th millennium B.C. Tx-109, which does not agree with others, was only sample collected on the screen rather than being picked up directly from the earth. The possibility is raised of mixture of materials from different strata, always a danger during screening procedure in sites of this sort. However, precautions taken in the field are believed to preclude any amount of mixture greater than about 2%. (F.J.P.): addition of 15% modern material would be needed to influence Tx-109 to the degree shown (Olson, 1963, fig. 3).

**Tx-139. Eagle Cave 128** **6060 ± 120**  
**4110 B.C.**

From Stratum IV, Sq. N90/W80, closely associated with massive accumulation of burned rock. *Comment:* appropriateness of date depends in part on dating of Stratum III (see below).

**Tx-138. Eagle Cave 171** **6110 ± 110**  
**4160 B.C.**

From Stratum III, Sq. N95/W80.

**Tx-195. Eagle Cave 107** **4360 ± 120**  
**2410 B.C.**

From Stratum III, Sq. N95/W90.

*Comment on Tx-138 and Tx-195:* not only do these dates disagree, but Tx-138 agrees with Tx-139 from the deeper Stratum IV and Tx-195 agrees with dates from a shallower zone, Stratum II (see below). Evidently we have not yet succeeded in dating either Stratum III, with its distinctive expanding-stem points, or Stratum IV.

**Tx-117. Eagle Cave D** **5550 ± 130**  
**3600 B.C.**

From Stratum II, sub-stratum 4, Sq. N90/W90.

**Tx-137. Eagle Cave 111** **4740 ± 140**  
**2790 B.C.**

From Stratum II, sub-stratum 4, Sq. N90/W95.

**Tx-196. Eagle Cave 101** **4580 ± 110**  
**2630 B.C.**

From Stratum II, sub-stratum 4, Sq. N95/W80.

**Tx-203. Eagle Cave 119** **4520 ± 120**  
**2570 B.C.**

From Stratum II, sub-stratum 4, in a hearth.

*Comment on samples from Stratum II, sub-stratum 4:* since 3 samples agree on a date in 3rd millennium B.C. (only Tx-117 being significantly different), we are provided with a preliminary estimate of the time when the Pandale point type—the principal type in this sub-stratum—was dominant in the area. (See also Tx-139 from Fate Bell site, this date list.)

**Tx-136. Eagle Cave 55-117** **3410 ± 80**  
**1460 B.C.**

From Stratum II, sub-stratum 1, Sq. N90/W90. *Comment:* dominant dart point forms in this sub-stratum were Langtry, Val Verde, and related varieties. C<sup>14</sup> dates for similar points from other sites are as follows: Centipede Cave—Tx-39, 1840 ± 400; Tx-41, 6530 ± 620; Tx-42, 5080 ± 310 (Texas II); Fate Bell—Tx-191, 3330 ± 110; Tx-192, 2330 ± 90 (this date list). There is little consistency in this group of dates, and age of the points remains in question.

### Fate Bell series

Samples from Fate Bell Shelter (41 VV 74) in upper Seminole Canyon ca. 9 mi W of Comstock (29° 42' N Lat, 101° 19' W Long). Fate Bell was partially excavated by Univ. of Texas in 1932, and information from that work was largely responsible for definition of the Pecos River Focus (Pearce and Jackson, 1933; Suhm *et al.*, 1954, p. 52-56). Samples listed here were collected in 1963 by C. D. Tunnell and M. L. Parsons in the course of stratigraphic testing to see whether information on cultural sequence, not obtained from the earlier work, could be found. Four principal strata were recognized in the 1963 work: Zone I (highest), with Ensor, Frio, and other expanding-stem points; Zone II, a layer of charcoal which may be a secondary deposit, with a contracting-stem point resembling the Langtry and Shumla types; Zone III, subdivided into Level I (upper) with Langtry, Val Verde, and similar points, and Level II (lower) with Pandale and similar points; Zone IV (deepest), with "Early Barbed" points and two painted pebbles. Comments by C.D.T. and M.L.P. All samples are charcoal.

**Tx-193. Fate Bell 70** **4170 ± 80**  
**2220 B.C.**

From Zone III, Level II, Lens 13. *Comment:* date agrees within 2σ statistics with Tx-203 from Eagle Cave (this date list). The associated assemblage of point types is not identical, but both dates are believed to apply to the Pandale type; hence this date lends further support to the dating of Pandale points in Eagle Cave.

**Tx-191. Fate Bell 29** **3330 ± 110**  
**1380 B.C.**

From Zone III, Level I, Lens 6. *Comment:* this date is in agreement within 1σ statistics with Tx-136 from Eagle Cave (this date list) which has similar point type associations. However, other relevant dates do not agree, as reviewed in the comment on Tx-136.

**Tx-192. Fate Bell 55** **2330 ± 90**  
**380 B.C.**

From Zone II. *Comment:* sample was closely associated with a pointed-

stem dart point, but, as noted, Zone II may represent a secondary deposition. The point is in the same category as those in the underlying zone (see Tx-191, above). No consistent dating is emerging for these points as yet; see comment for Tx-136, this date list.

### **Bonfire Shelter series**

Samples from Bonfire Shelter (41 VV 218) near Langtry (29° 49' N Lat, 101° 33' W Long). Cultural and faunal materials in this site are unusual for this area. This is primarily a stratified kill site where bison were driven over the canyon rim and butchered. The following cultural layers, listed from lowest to highest, are recognized: Bone Bed 1—extinct animal species, traces of charcoal, no recognizable artifacts; Bone Bed 2—large extinct bison, Plainview and Plainview-like points, one Folsom point; Intermediate Horizon—hearth and other cultural evidences about midway vertically between Bone Beds 2 and 3; Bone Bed 3—many hundreds of *B. bison* skeletons, dart points resembling Castroville and Montell types; Fiber Layer—perishable artifacts. Ensor and other expanding-stem dart points, Coll. 1963-64 by C. D. Tunnell and D. S. Dibble; comments by C.D.T. and D.S.D. All samples are charcoal.

#### **Tx-153. Bonfire 517**

**10,230 ± 160**  
**8280 B.C.**

From Bone Bed 2, Feature 27, a hearth. *Comment*: date agrees within 2 $\sigma$  statistics with most C<sup>14</sup> dates from other components containing Plainview or Folsom points: Plainview Quarry, L-303, 9800 ± 500 (Lamont IV); Lindenmeir, I-141, 10,780 ± 135 (Isotopes I); Lubbock Reservoir, C-558, 9883 ± 350 (Chicago II) and L-283, 9700 ± 450 (Lamont IV). One disagreement is with Plainview bone date 0-171, 7100 ± 160 (Humble I).

#### **Tx-152. Bonfire 468**

**7240 ± 220**  
**5290 B.C.**

From Intermediate Horizon, Feature 26, a hearth. *Comment*: date falls appropriately between those from Bone Beds 2 and 3 (Tx-153 and Tx-131, this date list) but is somewhat earlier than estimated from its position midway between these zones.

#### **Tx-131. Bonfire D**

**2510 ± 100**  
**560 B.C.**

From Bone Bed 3, in a hearth. *Comment*: agrees within 2 $\sigma$  statistics with two previous determinations from this layer: Tx-47, 2810 ± 110, and Tx-106, 2780 ± 100 (Texas II), and is consistent with stratigraphic sequence of dates in this site.

#### **Tx-151. Bonfire 465**

**1400 ± 130**  
**A.D. 450**

From Fiber Layer, Feature 25, a hearth. *Comment*: within later part of expected range of Late Archaic cultural materials in this layer, and consistent with stratigraphic position.

#### **Tx-194. Bonfire 548**

**1690 ± 80**  
**A.D. 260**

From Fiber Layer, lower 2 of 3 superimposed hearths making up Feature

29. *Comment*: agreement within  $2\sigma$  statistics with Tx-151 (above) from same layer.

**Tx-130. Bonfire C**

**1050  $\pm$  140**  
**A.D. 900**

From hearth. Feature 1, which could not be related to the cultural zones because of disturbed fill. Date was needed to help determine whether the hearth was aboriginal and, if so, to relate it to a cultural zone. *Comment*: agrees within  $2\sigma$  statistics with Tx-151 from Fiber Layer; therefore, the hearth may represent that occupation.

**Baker Cave series****Tx-128. Baker Cave A**

**8910  $\pm$  140**  
**6960 B.C.**

**Tx-129. Baker Cave B**

**9030  $\pm$  230**  
**7080 B.C.**

Charcoal samples from two places about 1 ft apart in Zone 8, NE corner of Sq. #1, Baker Cave (41 VV 213), a stratified rock shelter site on a tributary of the Devil's R ca. 3 mi from Baker's Crossing ( $29^{\circ} 59' N$  Lat,  $101^{\circ} 06' W$  Long). Zone 8 was a deeply buried occupation zone with scattered charcoal and the basal fragment of a Plainview-like dart point. Coll. 1963 by C. D. Tunnell and J. H. Word. *Comment* (C.D.T.): these dates are significantly more recent than Tx-153 (this date list) from Bone Bed 2 of Bonfire Shelter. The Baker Cave Plainview-like point shows some differences from Bonfire specimens, and could represent a later style. Dates here also do not agree with two dates from Plainview Quarry, cited in comment on Tx-153. Too little is yet known about the age of Plainview points to appraise these differences realistically.

*B. Central Texas*

For a brief statement explaining the terms for point types, stages, and cultural groupings in central Texas, see Texas II, p. 144-145.

**Britton Site series**

Two charcoal samples from Feature 10, a hearth, in the Britton site (41 ML 37), a buried alluvial terrace site on E side of N Bosque R, ca. 7 mi NW of Waco, McLennan County, Texas ( $31^{\circ} 37' N$  Lat,  $97^{\circ} 22' W$  Long). A Bulverde-like point found nearby in the terrace fill suggested that the hearth might date from no later than early Middle Archaic period. Samples were collected on two successive days in preliminary testing and were dated to help indicate whether the site deserved further investigation. Coll. 1964 by J. E. Corbin; subm. by Dee Ann Story, Texas Archeol. Salvage Project, Univ. of Texas, Austin.

**Tx-200. Britton 25-1**

**2080  $\pm$  80**  
**130 B.C.**

**Tx-201. Britton 25-2**

**2330  $\pm$  80**  
**380 B.C.**

*Comment* (D.A.S.): dates agree within  $2\sigma$  statistics. They seem more appropri-

ate for Late rather than Middle Archaic. Subsequent excavation has further strengthened the evidence provided by these dates that the alluvium accumulated relatively rapidly.

### **Pohl Site series**

Samples from Pohl site (41 CM 27) at mouth of Pohl Creek on Guadalupe R in Canyon Reservoir area, Comal County, Texas (29° 20' N Lat, 98° 10' W Long). Site provides badly needed stratigraphic evidence for artifact style sequence in Canyon Reservoir area. Lower levels contain artifacts of Early and Middle Archaic stages; upper levels contain Late and Transitional Archaic as well as Neo-American materials. Some dates below are without direct associations but are significant in the general interpretation of the series. Coll. 1962 by Don Williams; subm. by Dee Ann Story; comments by D.A.S. Samples are arranged here from deepest to shallowest. All are charcoal.

**Tx-119. Pohl A** **1870 ± 160**  
**A.D. 80**

Two samples combined, from Squares B-2 and B-4, 36 to 42 in. below surface. No direct diagnostic associations. *Comment*: more recent than one would expect from depth relative to other samples, except Tx-120.

**Tx-120. Pohl B** **1330 ± 140**  
**A.D. 620**

Three samples combined, from Squares B-1, B-2, and C-2, 18 to 24 in. below surface. No direct diagnostic associations. *Comment*: in proper sequence with Tx-119, but not with other dates from site.

**Tx-121. Pohl C** **2040 ± 130**  
**90 B.C.**

From Sq. C-2, 18 to 24 in. below surface. Frio point found in same sq. and level; hence sample may date Late Archaic period. *Comment*: date agrees with current thinking on age of Late Archaic in central Texas.

**Tx-122. Pohl D** **1600 ± 70**  
**A.D. 350**

Sq. C-10, 12 to 18 in. below surface. Late Archaic point found in same sq. and level. *Comment*: date is in proper stratigraphic sequence and is in line with current thinking regarding Late Archaic.

**Tx-123. Pohl E** **315 ± 75**  
**A.D. 1635**

Sq. C-4, 6 to 12 in. below surface. Two Scallorn points found in same sq. and level, but nearness to surface means that level could be mixed. Sample may date Austin Focus. *Comment*: date more recent than most estimates of Austin Focus age.

**Tx-124. Pohl F** **<160**

Sq. C-11, surface to 6 in. below surface. This level contained primarily Neo-American artifacts including Scallorn and Perdiz points. Nearness to surface means reliability may be suspect. *Comment*: despite associations, date and position suggest sample is not aboriginal.

**Kincaid Shelter series**

Charcoal samples from Kincaid Shelter (41 UV 2), at edge of Sabinal R valley, 3 mi N of Sabinal, Uvalde County, Texas (29° 22' N Lat, 99° 28' W Long). These samples continue the series in the previous date list (Texas II, p. 146-148) and are from Zone 5, a thick zone containing artifacts of the Archaic stage. Coll. 1953 and subm. by T. N. Campbell, Univ. of Texas, Austin.

**Tx-212. Kincaid 66****1300 ± 260****A.D. 650**

Test Pit 2, 66 to 72 in. below datum.

**Tx-213. Kincaid 67****750 ± 130****A.D. 1200**

Test Pit 2, 72 to 78 in. below datum.

*Comment* (T.N.C.): Test Pit 2, which was in the terrace fill E of shelter entrance, contained few diagnostic artifacts, but they showed the usual transitional situation from Archaic (Edwards Plateau) at the bottom to Neo-American (arrowpoints) at the top. Three other dates have already been published from this test pit: Tx-6, 30 to 36 in., 1120 ± 60 (Texas I); Tx-62, 18 to 30 in., 305 ± 110, and Tx-65, 78 to 84 in., 265 ± 135 (Texas II). Although no diagnostic samples were in direct association with Tx-212 and Tx-213, they are from a part of the pit which contained Archaic point types, a circumstance fitting only the early part of the 2σ range of Tx-212. Of the whole series of 5 dates from this test pit, only Tx-6 is reasonably compatible with typological and stratigraphic evidence. Reasons for recency of the other dates are not apparent either from field or laboratory evidence.

*C. Caddoan Area*

The following samples pertain to the chronology of the Caddoan archaeological area in adjoining parts of Texas, Oklahoma, Arkansas, and Louisiana (for a brief statement on current status of Caddoan chronology see Texas II, p. 154).

**Tx-110. Powell site 76, Arkansas****820 ± 80****A.D. 1130**

Charcoal from burned structure underneath a low ovate platform mound on Powell site (3 CL 9) in DeGray Reservoir area, Clark County, SW central Arkansas (34° 17' N Lat, 93° 17' W Long). Pottery sherds immediately below the charcoal were tentatively identified as Greenhouse Incised, French Fork Incised, Coles Creek Incised, and Davis Incised, apparently representing transitional Coles Creek-Gibson Aspect Caddo. In fill of overlying mound were sherds of the types Haley Complicated Incised and East Incised, probably representing a component of Haley Focus Caddo. Coll. 1963 by J. A. Scholtz; subm. by C. R. McGimsey III, Univ. of Arkansas Mus., Fayetteville, via E. M. Davis. *Comment* (J.A.S.): date is not incompatible with transitional Coles Creek-Gibson Aspect assignment; however, in view of stratigraphic position below a probable Haley Focus component, it seems late.

**Tx-111. Mineral Springs 612, Arkansas** **550 ± 60**  
**A.D. 1400**

Charcoal from beam, from floor of House I, a square structure built on 3rd stage of Mound 8, Mineral Springs site (3 HO 1), Howard County, Arkansas (33° 52' N Lat, 93° 54' W Long). Pottery associations were Handy, Hempstead, Friendship, and Glassell Engraved and Haley Complicated Incised, indicating a late Haley-early Texarkana transition. Two samples of the charcoal were prepared and counted separately, and the results averaged. Individual ages were 600 ± 80 and 500 ± 90. Another sample from same beam was dated by Isotopes, Inc. at 585 ± 100 (I-982; J. W. Griffin, Natl. Park Service, written commun.). Coll. 1962 by Fred Bohannon, Natl. Park Service; subm. by C. R. McGimsey III. *Comment* (E.M.D.): agreement with Isotopes date; archaeological associations point to early part of indicated time range.

**Tx-112. Bell site 329, Arkansas** **660 ± 100**  
**A.D. 1290**

Charred wood and cane fragments from Bell site (3 HO 11) E side Mine Creek, a tributary of Saline R, Howard County, Arkansas (33° 48' N Lat, 93° 55' W Long). Material is from fire basin of the upper of two round wattle and daub houses. Associated pottery sherds were of types Davis or East Incised, Handy Engraved, Pease Brushed-Incised, Canton Incised, and Sinner Linear Punctuated. There were also stubby, thick "long-stemmed" pipes. These associations, and the house type, indicate the house belongs to an unnamed focus of the Gibson Aspect. Coll. 1961 by J. A. Scholtz; subm. by C. R. McGimsey III. *Comment* (J.A.S.): earlier part of the indicated time range seems most likely in view of pottery associations.

**Denham Mound series, Arkansas**

Charcoal samples from different stages in the construction of Denham Mound I, E bank Ouachita R about 4 mi SW of Malvern, Hot Spring County, Arkansas (34° 20' N Lat, 92° 54' W Long). As reported by Wood (1963) the mound was built in three successive stages, the surface of each stage being marked by burned timbers, post molds, and pottery. Same pottery types were found in pre-mound levels and in each mound stage, notably Friendship Engraved, Military Road Incised, Blakely Engraved, and Foster Trailed-Incised. An exception is one class (Example D) present in sub-mound layer but absent in mound fill. Site is identified as a component of Mid-Ouachita Focus, Fulton Aspect, customarily dated at A.D. 1200 to 1600. Coll. 1961 by W. R. Wood; subm. by C. R. McGimsey III.

**Tx-113. Denham Mound 59** **795 ± 75**  
**A.D. 1155**

Burned log from ash layer underneath the mound.

**Tx-114. Denham Mound 34** **480 ± 80**  
**A.D. 1470**

Charred post from structure on top of Stage 1 of mound construction.

**Tx-115. Denham Mound 39** **585 ± 80**  
**A.D. 1365**

Charred post from burned structure on top of Stage 2 of mound construction.

**Tx-116. Denham Mound 33** **465 ± 80**  
**A.D. 1485**

Charred post from burned structure on top of Stage 3, the final stage of mound construction. It was covered by a foot of humus-laden soil.

*Comment on Denham Mound series (W.R.W.):* dates are well within expected range. The somewhat earlier date for Tx-113 from the sub-mound layer is probably significant in view of the slight difference in pottery type content of that layer.

**Tx-142. Belcher site, House 7, Louisiana** **555 ± 80**  
**A.D. 1395**

Charcoal from charred timber, House 7, Mound A, Belcher site (16 CD 13) on Cowhide Bayou E of Belcher, Caddo Parish, NW Louisiana (32° 44' N Lat, 93° 48' W Long). House 7 dates from Period III of Belcher site, and was occupied at beginning of Belcher Focus (Webb, 1959, p. 203-205). From this same timber another sample was dated by Humble at 200 ± 100 (0-322; Webb, 1959, p. 207); date felt to be too recent. Coll. 1955 and subm. by C. H. Webb, Shreveport, Louisiana. *Comment (C.H.W.):* date fits archaeological evidence better than Humble date, in view of lack of European trade material and evidences of trade or influence between this area and both Southwestern and Mississippian cultures in the 15th and 16th centuries. Early Belcher Focus includes carry-overs of Southern Cult materials and should date slightly later than such cult centers as the Craig Mound at Spiro, from which recent dates cluster in the 14th and 15th centuries (see comment with Tx-57, Texas II). Archaeologically it would be expected that date should fall between A.D. 1300 and the early 1500's.

**Sam Roberts Mound series, Texas**

Samples from Sam Roberts mound (41 CP 8), near Holly Springs, Camp County, Texas (32° 56' N Lat, 94° 50' W Long). Mound adjoins an occupation area with Titus Focus pottery sherds plus the type Pease Brushed-Incised, a combination which has also been found with similar mounds at the Whelan, Dalton, and Harroun sites, possibly signifying early Titus Focus times (Jelks and Tunnell, 1959, p. 59-60). Previous C<sup>14</sup> dates for this same complex are from Dalton Mound, Tx-83, 480 ± 110, and Harroun site, Tx-84, 490 ± 100 (Texas II). Coll. 1957 and subm. by E. B. Jelks, Texas Archeol. Salvage Project, Univ. of Texas, Austin.

**Tx-199. Sam Roberts A** **320 ± 60**  
**A.D. 1630**

Charcoal from an arc of burned poles in the mound, Sq. N30/W10, elev. 101.5 ft.

**Tx-202. Sam Roberts B** **240 ± 90**  
**A.D. 1710**

Charcoal from charred limbs or poles in the mound at N36.0/W8.9, elev.

101.7 ft. Field bag for this specimen was marked “charred limbs, poles or roots (?)” but field notes make no mention of roots, and sample is believed to relate to same structure as in Tx-199.

*Comment* (E.B.J.): dates agree within  $2\sigma$  statistics with Dalton and Harroun dates, but, in view of need for reasonably precise chronology, indicated time range for these sites is too wide to be very helpful. Earlier part of this range is most credible. There is no reason to believe that any of these sites was occupied more recently than the 16th century.

#### *D. Utah*

##### **Coombs Site series**

Charcoal and charred juniper wood from Coombs site (42 Ga 34) within community of Boulder, Garfield County, Utah ( $37^{\circ} 55' N$  Lat,  $111^{\circ} 25' W$  Long). This was a colony of the Kayenta Branch of the Anasazi culture, Pueblo II-III period. Fremont culture material occurs as trade. Ceramic dates range from A.D. 1075 to 1275, but actual occupation should have been brief, clustering around A.D. 1100 (Lister and Lister, 1961, p. 3-4). Coll. 1958 and 1959 by R. H. Lister; subm. by J. D. Jennings, Univ. of Utah, Salt Lake City, via Dee Ann Story, Univ. of Texas.

**Tx-132. Coombs I** **900 ± 85**  
**A.D. 1050**

Charcoal from Room 13, Structure A, an L-shaped surface structure.

**Tx-133. Coombs II** **1115 ± 85**  
**A.D. 835**

Charred wood from Structure Q, a pit house.

**Tx-134. Coombs III** **795 ± 80**  
**A.D. 1155**

Charcoal from Room 9, Structure G, a large U-shaped structure.

**Tx-135. Coombs IV** **785 ± 80**  
**A.D. 1165**

Charred wood from Room 2, Structure J, a 2-room surface structure.

*Comment* (R.H.L.): our dating of Coombs site was based on dates assigned the pottery types found there. The  $C^{14}$  dates for the surface structure fit our guess dates quite well, but Tx-133 from the pit structure, Structure Q, is significantly earlier than the pottery date. The pottery complex from all structures, including Structure Q, was identical—hence our reason for assigning them all comparable dates. Dates given pottery types by Colton (1952, 1955, 1956) may be too restrictive.

#### *E. Mexico*

##### **Cueva de la Zona series, Nuevo Leon**

Samples from Cueva de la Zona (site NL-92), a rock shelter ca. 31 km W of Linares, Nuevo Leon, NE Mexico, on the Ejido Santa Rosa ( $24^{\circ} 45' N$  Lat,  $99^{\circ} 49' W$  Long). The long stratified sequence comes from a 5-ft deposit of cultural debris, overlying a thick zone of gravel. All samples are from main excavation block bounded by the back wall and grid lines N5, W16 and W30.

The block was 15 ft square and was dug in arbitrary 0.25 ft levels numbered from the surface downward. Coll. 1963 and subm. by J. F. Epstein, Univ. of Texas, Austin. Samples are listed here in order of stratigraphic position, from highest to lowest. All are charcoal.

**Tx-204. Cueva de la Zona C1L3** **980 ± 130**  
**A.D. 970**

From Level 3, associated with arrow points of types Toyah, Fresno, and Starr.

**Tx-205. Cueva de la Zona C3L5** **845 ± 115**  
**A.D. 1105**

From Level 5, associated with arrow points of types Toyah, Fresno, and Starr.

**Tx-144. Cueva de la Zona C4L6** **1165 ± 75**  
**A.D. 785**

From Level 6, associated with arrow points of types Toyah, Fresno, and Starr, and other categories as yet not named. This is earliest occurrence of arrow points in the site, and hence may provide approx. date for appearance of the bow and arrow in southern Nuevo Leon.

**Tx-206. Cueva de la Zona C6L8** **1670 ± 110**  
**A.D. 280**

From Level 8, associated with early side-notched points.

**Tx-207. Cueva de la Zona C7L9** **1410 ± 130**  
**A.D. 540**

From Level 9, associated primarily with stemmed dart points. This is highest level in which Shumla dart points occurred, and may provide a terminal date for that type.

**Tx-208. Cueva de la Zona C8L10** **2160 ± 100**  
**210 B.C.**

From Level 10, associated with late stemmed dart points.

**Tx-209. Cueva de la Zona C9L11** **1990 ± 140**  
**40 B.C.**

From Level 11, associated with stemmed dart points and Shumla dart points.

**Tx-145. Cueva de la Zona C10L12** **2320 ± 90**  
**370 B.C.**

From Level 12, associated with Shumla points; may date early popularity of this type.

**Tx-146. Cueva de la Zona C11L13** **2470 ± 140**  
**520 B.C.**

From Level 13, with same associations as Tx-145 (above) but slightly deeper.

**Tx-147. Cueva de la Zona C12L14** **2100 ± 100**  
**150 B.C.**

From Level 14, associated mainly with points of Tortugas type. May date period when this type was most popular.

**Tx-148. Cueva de la Zona C13L15** **2920 ± 130**  
**970 B.C.**

From Level 15, with same associations as Tx-147 (above) but slightly deeper.

**Tx-149. Cueva de la Zona C14L17** **3130 ± 140**  
**1180 B.C.**

From Level 17, associated with stemmed dart points of Gary type. This is deepest occurrence of these points in the site, and hence probably earliest occurrence of Gary type in southern Nuevo Leon.

**Tx-150. Cueva de la Zona C18L21-22** **4840 ± 220**  
**2890 B.C.**

From Level 21-22, associated with very small projectile points of unknown affiliation but having essentially lanceolate shape. These are earliest projectile points found at the site, although evidences of occupation continue downward a short distance further.

*Comment on Cueva de la Zona series (J.F.E.):* the most important fact about this series is that with few exceptions (notably Tx-147) the dates form a neat sequence corresponding to vertical distribution. Yet what this means is not at all clear. Tx-204 and Tx-205 agree with present views on the appearance of arrow-points in Mexico and Texas, but the remaining dates are much more recent than expected in terms of C<sup>14</sup> evidence and current thinking (cf. dates for Shumla points in Coontail Spin series, Texas II, p. 152-153, and discussion of sequence and chronology in Johnson, 1964, p. 92-99 and especially Fig. 25). It may be assumed that materials collected from arbitrary 0.25 ft excavation levels over an area of more than 200 sq ft are not all contemporary, so that the degree of applicability of the dates to specific point types is difficult to estimate. The work at this site represents the first investigation of its sort in the area, and the situation will doubtless be considerably clarified when information from other sites can be added to that summarized here.

*F. Other***Tx-198. Mitchell site log, Illinois** **990 ± 90**  
**A.D. 960**

Wood from inner rings of large (260 to 280 annual rings) bald-cypress log in Feature 50, in post pit in plaza between mounds, Mitchell site (20B2-3), in the American Bottoms 3 mi N of Granite City, Illinois (38° 46' N Lat, 90° 05' W Long). Relates to brief occupation, Old Village-Trappist transition, believed to be in the range of A.D. 900 to 1100. Previous dates from same log: M-1305 from middle rings, 1000 ± 75 (Michigan VIII); TBNC 336-1 from outer rings, two dates, 1340 ± 40 (Fowler, n.d., p. 46-47) and 606 ± 76 (J. W. Porter, written commun.). Coll. 1961 by Taylor and Porter; subm. by J. W. Porter, Illinois Archaeol. Survey, via C. D. Tunnell, Univ. of Texas. *Comment (J.W.P.):* agrees well with Michigan date and archaeological evidence.

**Tx-143. Frankish spear** **1365 ± 135**  
**A.D. 585**

Fragment of wooden shaft from an iron spearhead believed to be from

Frankish period, A.D. 200 to 800. Northern Europe, specific location unknown. Dated in hope of placing the spear point in Frankish era and establishing that this type of spear, a well-made lanceolate form with ring decoration on the socket neck, was used during this period. Large error quoted is due to small sample size. Purchased 1963 and subm. by Frederick Wilkins, 532 Argo, San Antonio, Texas, via D. L. Olds, Univ. of Texas. *Comment* (F.W.): despite large error, date does place specimen in Frankish period and enables it to be used as comparison piece for other spear points.

**Tx-125. Kullaa, Finland****2420 ± 160  
470 B.C.**

Sledge runner found between peat and lake mud (gyttja), depth about 0.5 m in the profile near Kullaa, Finland (61° 30' N Lat, 22° 15' E Long). This type of sledge runner is from Finnish prehistoric and could date from beginning of Bronze Age (ca. 1400 to 1300 B.C.); it is very rare type, however, and typological dating is thus nearly impossible. Coll. 1962 by S. Museo and subm. 1963 by P. Alhonen, Dept. of Geol. and Paleo., Univ. of Helsinki, Snellmanink, Helsinki, Finland. *Comment* (P.A.): very suitable and reasonable.

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