[RADIOCARBON, VOL. 12, NO. 2, 1970, P. 577-589]

UNIVERSITY OF PENNSYLVANIA RADIOCARBON DATES XIII

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INTRODUCTION

This date list includes those series of samples completed in this laboratory as of November 1969. The B.P. ages are based upon A.D. 1950, and are calculated with a half-life value of 5568 yr. All samples were counted at least twice for periods of not less than 1000 minutes each. Errors quoted are derived from measurement of samples, background, and modern-age calibration, but do not include any half-life error. All samples were pretreated with 3N HCl, and some, where noted, were given additional pretreatment with 2% NaOH for the removal of possible humic contaminants.

Standard calibration samples are 125-yr old oak samples which, when corrected for age, have C^{14} contents equal to 95% of the NBS oxalic acid standard. The C^{13} relationship between the oak standard and NBS limestone standard #20 is $-25.7 \pm 1.3‰$ as measured on the University of Pennsylvania mass spectrograph.

SAMPLE DESCRIPTIONS

I. ARCHAEOLOGIC SAMPLES

A. Near East

Iran

Dinkha Tepe series, Iran

Dinkha Tepe (36° 59′ 51″ N Lat, 45° 10′ 41″ E Long) is in the Ushnu Valley, W Azerbaijan, Iran. Samples coll. during 1966 and 1968 excavations at Dinkha Tepe, carried out by the Hasanlu Project, jointly sponsored by Univ. Mus., Univ. of Pennsylvania; Metropolitan Mus. of Art of New York City and Archaeol. Service of Iran; subm. by excavation director, R. H. Dyson, Jr., Univ. Mus., Univ. of Pennsylvania. Remains of 4 major occupations have been uncovered: Dinkha I (Islamic); Dinkha II (Iron Age II equal to Hasanlu IV, ca. 1000-800 B.C.); Dinkha III (Iron Age I equal to Hasanlu V, ca. 1350-1000 B.C.) and Dinkha IV (Bronze Age equal in part to Hasanlu VI, ca. ?1900-?1350 B.C.). This chronology is based on earlier radiocarbon dates from Hasanlu and studies of relative chronology (Dyson, 1965; Ralph, 1959; Stuckenrath, 1963; Stuckenrath *et al,* 1966).

Dinkha III

P-1475. DiS 66-44, B7f(5) **3005 ± 36**
1055 B.C.

Charcoal immediately overlying Wall A, in Area B7, from top of central mound. *Comment*: NaOH pretreatment.

3157 ± 55

P-1474. DiS 66-113, B8e(3) 1207 B.C.

Charcoal from shallow pit over stone foundation of Wall E in Area B8, from top of central mound. Stratigraphically earlier than Wall A and P-1475. *Comment*: NaOH pretreatment.

3099 ± 71

P-1449. DiS 66-52, B9a(7) 1149 B.C.

Charcoal from Test Trench 3 immediately above and resting on terminal Bronze age deposit (8), base of Dinkha III fill in Area B9 from N edge of central mound. Connecting trench to B8e shows (3) in that area to be closely related in time (cf. P-1474). *Comment*: NaOH pretreatment.

Dinkha IV

3285 ± 50

P-1231. DiS 66-54a, B9a(8) 1335 B.C.

Charcoal from terminal Bronze age deposit (8) directly underlying Iron age fill (7) (cf. P-1449), ca. 1 m from S balk at W edge of Test Trench 3 in Area B9, N edge of central mound. *Comment*: NaOH pretreatment.

3402 ± 50

P-1232. DiS 66-79, B10a(8) 1452 B.C.

Charcoal from main floor of final major Bronze age structure in Area B10a(8), N edge of central mound underlying terminal stratum B9a(8) (cf. P-1231). *Comment*: NaOH pretreatment.

3434 ± 61

P-1450. DiS 66-127, B10a(8)[1] 1484 B.C.

Charcoal from burned structural beams in fill near floor of final major structure of Bronze age in Area B10a(8), N edge of central mound (cf. P-1232). *Comment*: NaOH pretreatment.

3522 ± 63

P-1452. DiS 66-129, B10a(9) 1572 B.C.

Charcoal from stratum of trashy fill, Area B10a(9), N edge of mound on which final Bronze age structure in this area stands (cf. P-1232 and P-1450). Tombs B27 and B28 dug into this level.

3458 ± 59

P-1233. DiS 66-126a/2, G10g(2) 1508 B.C.

Charcoal from ashy fill (2) under clay floor (IA) and Walls G and F in Area G10g at E edge of central mound. Area not stratigraphically linked to preceding areas, but typologically (using ceramics) equal to B10a(9) (cf. P-1452). *Comment*: NaOH pretreatment.

3468 ± 59

P-1430. DiS 66-91, Hig(2) 1518 B.C.

Charcoal from floor assoc. with Wall D in Area Hlg at E end of central mound. Comparable stratigraphically to P-1233, below latest walls of probable Iron age in the area, and above earlier massive Wall H1h-E. *Comment*: NaOH pretreatment.

3468 ± 59

P-1552. H1G **1518 B.C.**

Charcoal from room fill of Big Wall, Area H1G of E edge of central mound. *Comment*: NaOH pretreatment.

3598 ± 66

P-1429/31. DiS 66-131/116, H1h(3) **1648 B.C.**

Charcoal from floor to N of Wall F and from pit cut into Wall G from (3) in Area H1h, E end of central mound. Walls F and G abutt top of earlier massive wall H1h-E, dating to earlier half of Bronze age occupation. Should thus provide an *ante quem* date for this part of the period.

General Comment: (R.H.D.) dates recovered fit stratigraphic relationships of the samples very well and, using the 5730 half-life, indicate a general range of time for the later Bronze age occupation of 1756 ± 68 to 1434 ± 52 B.C. with the following Iron Age I deposits between 1302 ± 57 and 1146 ± 37 B.C. Earlier part of Bronze age deposit must be prior to 1756 ± 68 B.C., but should be later than Hasanlu VII, radiocarbon dated to ca. 2100 B.C.

Ganj Dareh Tepe series, Iran

Ganj Dareh Tepe ("Mound of the Treasure Valley"), alt 1300 to 1400 m, ca. 20 km S of Bisitun village in Kermanshah Dist., W Iran (34° 20′ N Lat, 47° 30′ E Long), is an early Neolithic stratified mound containing solid architecture and small quantities of simple software pottery in most levels. Samples coll. and subm. 1967 by P. E. L. Smith, Univ. of Montréal, Canada (Smith, 1967, 1968; Young and Smith, 1966; Kigoshi, 1967).

8888 ± 98

P-1486. Square 17-0, depth 2.10 to 2.40 m **6938 B.C.**

Charcoal, Sample 67-27, from a room occupation floor in W part of Sq. 17-0, depth 2.10 to 2.40 m in what seems to be the 4th building phase (Level B). *Comment*: NaOH pretreatment. Sample was expected to be approx. same age as, or slightly earlier than GaK-994, 8910 ± 170 B.P. (Radiocarbon, 1967, v. 9, p. 61).

9239 ± 196

P-1485. Square 19-N, depth 4.50 m **7289 B.C.**

Charcoal, Sample 67-23, from SW corner of Sq. 19-N, depth 4.50 m, from floor deposits inside walls of what is probably a room of the 2nd architectural phase (provisionally called Level C). *Comment*: date is probably less reliable than other 2 in this series, as sample was undersized, precluding NaOH pretreatment, and necessitating low pressure counting. Excavator believed this sample to be younger than GaK-807, 10,400 ± 150 B.P. (from basal level in a 1965 sounding) but older than GaK-994, 8910 ± 170 B.P. (Radiocarbon, 1967, v. 9, p. 61).

8968 ± 100

P-1484. Square 16-N(a), depth 6.20 m **7018 B.C.**

Charcoal, Sample 67-26, from Sq. 16-N(a), depth 6.20 m, ca. 20 cm

below a brick wall, at the base of the earliest certain architectural phase (Level D) but above basal deposits apparently lacking solid architecture (provisionally Level E). *Comment*: NaOH pretreatment. The level producing this sample is stratigraphically below the one producing P-1485.

Godin Tepe series, W Iran

Godin Tepe (34° 31′ N Lat, 48° 3′ E Long), in SE corner of the Kangovar Valley, at alt ca. 1400 m is mainly noteworthy for its long sequence, ca. 5500 to 600 B.C. and particularly for deposits of 2nd millennium B.C. Samples coll. by I. Winter and L. D. Levine; subm. by T. C. Young, Jr., Royal Ontario Mus., Univ. of Toronto (Young and Smith, 1966).

General Comment: all samples given NaOH pretreatment. For additional dates from levels stratigraphically below those of this list, see: GaK-1072, 4400 ± 100 B.P. and GaK-1071, 3860 ± 120 B.P. (Young, 1969).

3203 ± 50

P-1469. Operation A1, Stratum 5, floor 1253 B.C.

Charcoal and burned soil from hearth area assoc. with Pit 4, from terminal occupation level of Period III and should date approx. end of late Bronze age in central W Iran.

2742 ± 41

P-1470. Operation A2, Stratum 5, Area 8 792 B.C.

Bits of charcoal and burned earth from floor debris of terminal occupation level of Period III and should date approx. end of late Bronze age in central W Iran.

P-1471. Operation A1, Stratum 5A, Area 5, Floor 2A 2673 ± 52 723 B.C.

Charred grain and burned earth from badly destroyed occupation level immediately beneath foundations of Period II fortification. Date should supply *terminus post quem* for Period II, ca. 800 B.C. *Comment*: slightly undersized sample, counted at 98.74% normal pressure.

P-1472. Operation A1, Stratum 5A, Area 5, Floor 2A 2550 ± 53 600 B.C.

Charcoal and burned earth from badly destroyed occupation level immediately below foundations of Period II fortification. Date should supply *terminus post quem* for Period II, ca. 800 B.C.

Turkey

Gedikli series

Gedikli (Karahöyük) (37° N Lat, 36° 37′ E Long), is a mound in Gaziantep Prov. of SE Turkey, revealing subsequent strata from Chalcolithic to Byzantine periods, whose early Bronze age cremation necropolis is of importance. Coll. 1966 by A. M. Dinçol and R. Özgürel and subm. by U. B. Alkim, Univ. of Istanbul (Alkim and Alkim, 1966; Mellink, 1965, 1966).

3877 ± 57
P-1461. C-trench, cremation area **1927 B.C.**
Charcoal from C-trench, cremation area, Samples 1, 2, and 3.

3676 ± 50
P-1464. Cremation vessel, C-trench **1726 B.C.**
Charred earth, fragments of bone and charcoal in cremation vessel, from ca. 2 m below surface of slope of mound, C-trench, cremation area, Sample 6.

4267 ± 65
P-1463. A_1-trench, IIIj **2317 B.C.**
Charred grain from A_1-trench, IIIj, Sample 5.

4212 ± 74
P-1462. A_1-trench, IIIk **2262 B.C.**
Charred grain from A_1-trench, IIIk.

Dereagzí series, Turkey

Dereagzí (36° N Lat, 29° E Long), is a middle Byzantine church near village of Dirginler (Kas Kazīsī, Antalya Vilâyeti), S Turkey. Both samples are from same beam of *Cedrus libani* (wood id. by B. F. Kukachka, Forest Products Lab., U.S. Dept. of Agric., Madison, Wisconsin) which should be contemporary with founding of church. Church can be dated between A.D. 843 and A.D. 907. Coll. and subm. 1967 by J. Morganstern, Inst. of Fine Arts of New York Univ., New York.

1156 ± 44
P-1437. Sample 1 **A.D. 794**
Wood from outer edge of beam.

1236 ± 43
P-1438. Sample 2 **A.D. 714**
Wood from outer edge of beam, but cut penetrated more deeply into interior of beam than did P-1437.
General Comment: since the 2 dates are from the same region of a single beam, and the dates are statistically consistent, an average age of A.D. 754 ± 36 can be used.

333 ± 44
P-1395. Yassi Ada Shipwreck **A.D. 1617**
Wood from hull of extremely well-preserved shipwreck of unknown date, overlying part of Late Roman shipwreck in 135 ft water at Yassi Ada, Turkey (36° 59′ N Lat, 27° 12′ E Long). Coll. and subm. 1967 by G. F. Bass, Univ. Mus., Univ. of Pennsylvania, Philadelphia.

Jordan

Tell es-Sa'idiyeh series, Jordan

Tell es-Sa'idiyeh (32° 16′ N Lat, 35° 35′ E Long), lies ca. 2 km E of Jordan R., immediately S of Wadi Kufrinje, Jordan. Coll. 1965 and 1966 during excavation of higher mound and subm. by J. B. Pritchard, Univ. Mus., Univ. of Pennsylvania, Philadelphia. Samples are from floors

within a complex of buildings believed, on basis of tentative estimate for date of pottery, to have been destroyed during the centuries noted below (Pritchard, 1964a, b; 1965a, b, c; 1966a, b).

Acropolis series, Floor of Hellenistic building, 2nd century B.C.

2098 ± 55
P-1095. Area 31-C-7, Floor 1 **148 B.C.**
Wood from roof beam.

2199 ± 55
P-1096. Area 31-B-8, South balk **249 B.C.**
Wood from burnt beam.

2179 ± 53
P-1097. Area 31-B-8 **229 B.C.**
Charcoal from beam.

2267 ± 53
P-1098. Area 31-B-6 **317 B.C.**
Charcoal from beam.

2228 ± 48
P-1447. Area 31-B-6 **278 B.C.**
Charcoal, over Floor 1.

General Comment: all samples received NaOH pretreatment. The 5 dates are statistically consistent, with an average date of 244 ± 53 B.C.

Floor of "Persian" Palace, 3rd or 4th century B.C.

2226 ± 50
P-1446. "Persian" palace, Area 31-E-6 **276 B.C.**
Charcoal from "Persian" palace, Floor 1c. *Comment*: NaOH pretreatment.

Below "Persian" palace series

2415 ± 54
P-1442. Area 31, Room 8/7 (W) **465 B.C.**
Grain, N sec., along E wall.

2310 ± 100
P-1443. Area 31, Room 5/4 **360 B.C.**
Charcoal, clearing furnace, below jar in N sec. of furnace. *Comment*: this date is of single count only.

2141 ± 55
P-1445. Area 31-E-7, Floor 3 **191 B.C.**
Grain, (House 4 N of S sec. of kiln).

2485 ± 57
P-1448. Area 31-E/F-7/8, Room 5/1W **535 B.C.**
Grain, N sec. along E wall on or above floor.

General Comment: all samples in this series received NaOH pretreatment. Omitting, P-1445, remaining 3 dates are statistically consistent, with average date of 453 ± 73 B.C.

Trench series, Level 2, 8th century B.C.

2424 ± 57
P-1100. Area 23-E-3 **474 B.C.**

Charcoal from beam, near E wall of back room on Floor II. *Comment*: compare P-1100 with P-832, 2406 ± 52 and P-385, 2418 ± 54 (Radiocarbon, 1965, v. 7, p. 195). These 3 dates are statistically consistent, with average date of 466 ± 54 B.C.

2577 ± 53
P-1099. Area 23-G-2 **627 B.C.**

Charcoal. *Comment*: NaOH pretreatment.

2609 ± 58
P-1101. Area 23-G-4 **659 B.C.**

Charcoal from beam. *Comment*: NaOH pretreatment.

2633 ± 60
P-1444. Area 23-G-4, Floor 2 **683 B.C.**

Charcoal from Floor 2. *Comment*: NaOH pretreatment.

General Comment: compare P-1099, P-1101, and P-1444 with P-829, 2596 ± 56; P-830, 2572 ± 59; P-831, 2542 ± 46; P-833, 2537 ± 52; P-834, 2726 ± 157; and P-836, 2523 ± 53 (Radiocarbon, 1965, v. 7, p. 195). These 9 dates are statistically consistent, with average date of 640 ± 55 B.C.

Lebanon

Cedars of Lebanon series, Lebanon

Wood (*Cedrus libani*) from structures dating to early Egyptian dynasties suggested dendrochronologic correlation among several structures; also, since wood was imported originally from the Levant, possible correlation with samples found in that part of the Mediterranean. "Buried" cedar sample of sufficient antiquity (see P-WA-LEB-1), was obtained, but proved unusable for dendrochronologic purposes as ring pattern was complacent. Another sample from allegedly old specimen proved too recent to be of value for this type of correlation (see P-WA-LEB-2).

Cedars of Lebanon (P-WA-LEB-1)

Cross sec. of *Cedrus libani* buried in landslide near Chkiff, Lebanon, ca. (35° 51′ N Lat, 35° 45′ E Long). Uncovered during re-terracing in 1962. Sec. coll. 1964 and subm. by H. N. Michael, Univ. Mus., Univ. of Pennsylvania, Philadelphia.

2901 ± 44
P-890. Pith, Rings 1 to 16 **951 B.C.**

$\delta C^{13} = +0.5‰$ from Oak standard.

3133 ± 36
P-891. Rings 16 to 23 **1183 B.C.**

$\delta C^{13} = 0‰$ from Oak standard.

2837 ± 40

P-892. Rings 184 to 188 **887 B.C.**

$\delta C^{13} = -1.8‰$ from Oak standard. *Comment*: compare with I-512, 2560 ± 150 B.P. (Troutman, 1965, written commun.).

0 ± 100

P-1089. Cedars of Lebanon (P-WA-LEB-2) **A.D. 1950**

Cross sec. from trunk (*Cedrus libani*) found in cave several mi N of "les Cedres", Lebanon, (ca. 34° 20′ N Lat, 36° 10′ E Long). Coll. 1965 by G. Wahbé, Beirut; subm. by H. N. Michael. Sample was taken from sec. 20 rings inside of bark.

4290 ± 56

P-1025. Cedars of Lebanon (P-EG-DAS-1) **2340 B.C.**

Wood ("floater", *Cedrus libani*) from floor of upper chamber of Bent Pyramid at Dashur (29° 45′ N Lat, 31° 12′ E Long), at one time integral part of a beam bracing lower part of upper chamber (Fakhry, 1959, p. 52-59, pls. XII, XIII; Fakhry, 1961, p. 88-94). Presumably assoc. with construction of pyramid during reign of Sneferu (2680 to 2656 B.C.). Coll. 1965 and subm. by H. N. Michael.

B. Mediterranean

Greece

Mycenae series, Argolis, Greece

Samples are from Citadel House at Mycenae (37° 44′ N Lat, 22° 44′ E Long) Argolis, Greece. Coll. 1964 and 1966 during excavation by British School at Athens; subm. by Lord Wm. Taylour, British School at Athens.

2873 ± 57

P-1454. Gamma 21, No. 7 **923 B.C.**

Carbonized matter from pure Mycenean level, upper Hellenistic levels removed.

2974 ± 49

P-1455. Gamma 23, No. 5 **1024 B.C.**

Charcoal from pure destruction level of 13th century B.C. *Comment*: NaOH pretreatment.

3035 ± 65

P-1456. Gamma 23, No. 6 **1085 B.C.**

Charcoal from pure destruction level of 13th century B.C. *Comment*: NaOH pretreatment.

2948 ± 49

P-1457. Gamma 23, No. 9 **998 B.C.**

Fragments of burnt beam from what appears to be 13th century B.C. destruction level. *Comment*: NaOH pretreatment.

2961 ± 50

P-1459. Gamma 22, No. 1 **1011 B.C.**

Charcoal from Mycenean level.

Italy

2243 ± 48

P-1432. Le Muraglie **293 B.C.**

Wood charcoal (id. by B. F. Kukachka, Forest Products Lab., U.S. Dept. of Agric., Madison, Wisconsin, as of white oak group), from Excavation 5 assoc. with crude walls (possibly Greek) underlying Roman structure at Le Muraglie, a low plateau on SE perimeter of plain of Sybaris, Cosenza, Italy (39° 43′ N Lat, 16° 33′ E Long). Coll. 1964 and subm. by E. K. Ralph, Univ. Mus., Univ. of Pennsylvania, Philadelphia (Rainey and Lerici, 1967, p. 198-199).

1328 ± 48

P-1435. Pantano Longarini Wreck **A.D. 622**

The Pantano Longarini wreck (36° 19′ N Lat, 15° 8′ E Long) near Cape Passaro-Pachino, SE cape of Sicily, was found during winter 1963-1964, in salty marsh 600 m from present shore line, while digging drainage canal as part of reclaiming operation. Sample coll. 1965 and subm. by P. Throckmorton, Univ. Mus., Univ. of Pennsylvania, Philadelphia. Wood id. as *cyparissus semiviperens* by B. F. Kukachka. Previous sample from this wreck, dated in Germany, dated at A.D. 500 ± 150 and "combed pottery" finds indicate date of 4th to 6th century A.D. (Throckmorton and Kapitan, 1968).

2027 ± 43

P-1436. Torre Sgarrata Wreck **77 B.C.**

Torre Sgarrata (Sassole) wreck, near Taranto, Italy (40° 14′ N Lat, 17° 13′ E Long) was originally located by fishermen before World War I because some marble sarcophagi of the cargo was visible through 10 m water when storms swept away sand covering site. Sample coll. and subm. 1965, by P. Throckmorton during survey explorations of different wrecks along coast between Porto Caesareo and Taranto. Wood id. as *Pinus Halepensis* by B. F. Kukachka. Small finds indicate date ca. 200 A.D. for time of actual sinking (Throckmorton, 1969).

2161 ± 39

P-1056. Site X, Galli Islands, Salerno **211 B.C.**

Wooden core from lead anchor stock, recovered from 35 m water at Site X, Galli Is., Salerno, Italy (40° 34′ 46″ N Lat, 14° 26′ 1″ E Long). Coll. 1964 by R. E. L. Love, Jr. and Col. J. D. Lewis; subm. 1965 by J. D. Lewis, Naval War College, Newport, Rhode Island. Wood id. as one of several live oak (*Quercus*) types growing in Mediterranean region by B. F. Kukachka. *Comment* (J.D.L.): lead-stocked anchors were in use from 300 B.C. to ca. 400 A.D. (Love and Lewis, 1964; Torr, 1964; Frost, 1963; Casson, 1960; Ucelli, 1950).

C. Southwest Asia

Afghanistan

Ghar-i-Mar series, Afghanistan

Ghar-i-Mar (Snake Cave) is a rock shelter, on a high terrace of the

Balkh R. in limestone hills of Hindu Kush Mts, ca. 100 km S of Mazar-i-Sharif near the town of Aq Kupruk (36° 5′ N Lat, 66° 51′ E Long). Samples coll. 1962 by L. Dupree and subm. by R. Dyson, Univ. Mus., Univ. of Pennsylvania, Philadelphia. For additional dates from this site see Hv-425, 8650 ± 100; Hv-426, 1390 ± 60; Hv-427, 1340 ± 70; Hv-428, 7220 ± 100; and Hv-429, 7030 ± 110 (Radiocarbon, 1964, v. 6, p. 263-264; Coon, 1957; Dupree, 1959, 1964).

General Comment: all samples given NaOH pretreatment.

P-1489. Trench I, Cut 1a — **1276 ± 40** / **A.D. 674**
Charcoal: Upper Red Earth.

P-1490. Trench I, Cut 5n — **1614 ± 41** / **A.D. 336**
Charcoal: 220-Red Loess above Upper Gravels.

P-1491. Trench I, Cut 6p — **1436 ± 47** / **A.D. 514**
Charcoal: 130-Red Loess above Upper Gravels.

P-1492. Trench I, Cut 6q — **1602 ± 48** / **A.D. 348**
Charcoal: 130-Red Loess above Upper Gravels.

P-1493. Deh Morasi Ghundai — **4414 ± 53** / **2464 B.C.**
Charcoal and fire-burned earth from 300 to 320 cm level of Deh Morasi Ghundai (31° 35′ N Lat, 65° 30′ E Long) a Chalcolithic site in S-central Afghanistan. Coll. 1951 and subm. 1960 by L. Dupree (1963). Date was expected to be comparable to that from Mundigak, C-815, 4625 ± 300 (Libby, 1955).

D. Africa

Senegal

Kagnout series, Senegal

Lo-Oul-6 (Loudia-Oulof), Mound A, located inland near village of Kagnout (42° 33′ N Lat, 16° 37′ W Long), is one of archaeol. sites consisting of artificial shell-middens in broad delta region of the lower Casmanance R. in the SW corner of Senegal. Coll. 1966; subm. by O. Linares de Sapir, Dept. of Anthropol., Univ. of Pennsylvania, Philadelphia. Dates for 2 other sites, Lo-Oul-1: Si-489, 369 ± 68; Si-490, 893 ± 49; Si-491, 311 ± 97; Si-492, 476 ± 49; Si-493, 573 ± 136; Si-494, modern; Si-495, 379 ± 68; Si-496, 2087 ± 68 and Di-3: Si-497, 320 ± 49; Si-499, 1631 ± 78 (Linares de Sapir, 1969, written commun., 1969a, b).

P-1478. 40 to 70 cm — **1226 ± 50** / **A.D. 724**
Charcoal, combined Samples 285-287.

P-1479. 70 to 100 cm — **1197 ± 45** / **A.D. 753**
Charcoal, combined Samples 288-290.

1175 ± 50

P-1480. 100 to 110 cm **A.D. 775**

Charcoal, Sample 291.

1292 ± 52

P-1481. 110 to 130 cm **A.D. 658**

Charcoal, Samples 292 and 293.

1263 ± 51

P-1482. 130 to 150 cm **A.D. 687**

Charcoal, Samples 294 and 295.

1606 ± 50

P-1483. 150 to 170 cm **A.D. 344**

Charcoal, Samples 296 and 297.

General Comment: excluding P-1483, A.D. 344, remaining dates are statistically consistent, with average date of A.D. 719 ± 50, chronologically placing this shell-midden within Casmanance Period II, ca. 344 ± 50 to A.D. 719 ± 50.

E. Far East

Thailand

Chansen series, Thailand

Main occupation of Chansen (15° 7′ N Lat, 100° 27′ E Long), Takli Dist., Nakhon Province, Thailand, belongs to Dvaravati period (ca. 6th to 10th century A.D.), earliest historic period of Thailand. Samples in this series are all pre-Dvaravati, coll. 1968 and subm. by G. F. Dales, Thailand Fine Arts Dept. and Univ. Mus., Univ. of Pennsylvania, Philadelphia.

1580 ± 50

P-1507. Operation B, Level 8 **A.D. 370**

Charcoal, Sample 1, from Operation B, Level 8 (3 m sq. test pit), 145 to 164 cm beneath surface, in 5th natural stratum from surface, partly sealed by layer of hardpan. *Comment* (G.F.D.): this sample cannot be ordered in stratigraphic relation to the other samples, as area was badly disturbed by modern pot-hunting.

1573 ± 35

P-1540. Operation C, Level 6 **A.D. 377**

Charcoal, Sample 8. *Comment*: NaOH pretreatment.

1595 ± 52

P-1541. Operation C, Level 7 **A.D. 355**

Charcoal, Sample 9, 190 cm beneath ground surface. *Comment*: NaOH pretreatment.

1503 ± 43

P-1509. Operation C, Level 7, hearth **A.D. 447**

Charcoal, Sample 3, W side of excavations, 204 to 210 cm beneath ground surface. *Comment*: NaOH pretreatment.

P-1538. Operation C, Level 7 **1540 ± 47 A.D. 410**

Charcoal mixed with powdery ash, Sample 4, from same hearth as P-1509, 210 to 215 cm beneath ground surface. *Comment*: NaOH pretreatment.

P-1539. Operation C, Level 7 **1491 ± 47 A.D. 459**

Charcoal, Sample 5, from bottom of same hearth as P-1509 and P-1538, 215 to 220 cm beneath ground surface. *Comment*: NaOH pretreatment.

P-1543. Operation C, Level 7 **2145 ± 36 195 B.C.**

Charcoal, Sample 10, in small pit containing burnt sherds and a large animal bone. *Comment*: NaOH pretreatment.

P-1508. Operation C, Level 9 **1830 ± 47 A.D. 120**

Charcoal, Sample 2, from control pit in SE corner, 220 to 230 cm beneath ground surface. Stratigraphically sealed beneath layer of marl and concretion, 200 cm beneath ground surface. *Comment*: NaOH pretreatment.

P-1512. Operation D, a, Level 9 **1890 ± 41 A.D. 60**

Charcoal, Sample 6, from "midden" deposit containing a smashed skull and snail shell 225 cm beneath ground surface. *Comment*: NaOH pretreatment. (G.F.D.): assoc. with ivory comb which is earliest known ivory object from Thailand.

II. GEOLOGIC SAMPLE

A. Scandinavia

Finland

P-1542. Linnansuo Bog **5183 ± 56 3233 B.C.**

Wood from core of Linnansuo Bog, market town of Imatra, Finland (61° 11′ N Lat, 28° 48′ E Long), from top of peat layer, beneath clay formed on bog at time of formation of present outlet (Vuoksi R.) of Lake Saimaa. According to pollen analysis this occurred earlier than Zone Boundary VIII/IX (Hellaakoski, 1936; Lappalainen, 1962). Coll. 1967 by M. Saarnisto; subm. by J. J. Donner, Univ. of Helsinki, Finland.

References

Alkim, U. B. and Alkim, H., 1966, Excavations at Gedikli (Karahöyük)-First preliminary report: Belletin, v. 30, p. 177.
Casson, Lionel, 1960, The Ancient Mariners: London, Macmillan, 286 p.
Coon, C. S., 1957, The Seven Caves: New York, Knopf, 338 p.
Dupree, Louis, 1959, Shamshir Gar: Anthropol. Papers Am. Mus. Nat. History, v. 46, pt. 2, p. 299-304.
———— 1963, Deh Morasi Ghundai: a Chalcolithic site in south-central Afghanistan: Anthropol. Papers Am. Mus. Nat. History, v. 50, pt. 2, p. 57-136.

Dupree, Louis, 1964, Prehistoric archaeological surveys and excavations in Afghanistan: 1959-1960 and 1961-1963: Science, v. 146, no. 3644, p. 638-640.
Dyson, Jr., Robert, 1965, Problems of Protohistoric Iran as seen from Hasanlu: Jour. Near Eastern Studies, v. 24, p. 193-217.
Fakhry, Ahmed, 1959, The Bent Pyramid: The Monuments of Sneferu at Dashur, v. 1: Cairo, Egypt, Gen. Org. Govt. Printing Office.
———— 1961, The Pyramids: Chicago, Univ. of Chicago Press, 260 p.
Frost, Honor, 1963, Under the Mediterranean: London, Prentice Hall, 278 p.
Hellaakoski, A., 1936, Das Alter des Vuoksi: Comm. Geol. Finlande Bull., v. 115, p. 31.
Kigoshi, Kunihiko, 1967, Gakushuin natural radiocarbon measurements VI: Radiocarbon, v. 9, p. 43-62.
Lappalainen, V., 1962, The shore-line displacement on southern Lake Saimaa: Bot. Fennica Acta, v. 64, p. 125.
Libby, W. F., 1955, Radiocarbon dating, 2nd ed.: Chicago, Univ. of Chicago Press, ix, 175 p.
Linares de Sapir, Olga, 1969a, Shell middens of Lower Casmanance and problems of Diola Prehistory: W. African Jour. of Archaeol., v. 1, in press.
———— 1969b, Diola pottery of the Fogny and Kasa: Expedition, v. 11, p. 2-11.
Love, Jr., R. E. L. and Lewis, J. D., 1964, Report of recovery of antiquities from Site X in the Gulf of Salerno: ms. on file, Supt. Antiquities, Prov. of Salerno, Italy.
Mellink, M., 1965, Anatolian Chronology: chronologies in old world archaeology, Chicago, Univ. of Chicago Press, p. 123.
———— 1966, Archaeology in Asia Minor: Am. Jour. Archaeol., v. 70, no. 3, p. 279-280.
Pritchard, J. B., 1964a, Excavating a Biblical site in Jordan: Illus. London News, v. 244, no. 6504, p. 487-489.
———— 1964b, Two Tombs and a Tunnel in the Jordan Valley: Expedition, v. 6, no. 4, p. 2-9.
———— 1965a, First excavations as Tell es-Sa'idiyeh: Biblical Archaeologist, v. 28, p. 10-17.
———— 1965b, Cosmopolitan Culture of the Late Bronze Age: Expedition, v. 7, no. 4, p. 26-33.
———— 1965c, Chronique Archaeologique: Rev. Biblique, v. 72, p. 257-262.
———— 1966a, Three ages of Biblical Zarethan: Illus. London News, v. 246, no. 6622, p. 25-27.
———— 1966b, Chronique Archaeologique: Rev. Biblique, v. 73, p. 574-576.
Ralph, E. K., 1959, Univ. of Pennsylvania radiocarbon dates III: Radiocarbon, v. 1, p. 45-58.
Rainey, F. G. and Lerici, C. M., 1967, The search for Sybaris: Rome, Lerici Editori, p. 37-52.
Smith, P. E. L., 1967, Survey of excavations in Iran during 1965-66: Ghar-i Khar and Ganj-i-dareh Tepe: Iran, v. 5, p. 138-139.
———— 1968, Survey of excavations in Iran during 1967: Ganj Dareh Tepe: Iran, v. 6, p. 158-160.
Stuckenrath, R., Jr., 1963, Univ. of Pennsylvania radiocarbon dates VI: Radiocarbon, v. 5, p. 82-103.
Stuckenrath, R., Jr., Coe, W. R., and Ralph, E. K., 1966, Univ. of Pennsylvania radiocarbon dates IX: Radiocarbon, v. 8, p. 348-385.
Throckmorton, Peter, 1969, Ancient shipwreck yields new facts and a strange cargo: Natl. Geographic, v. 135, no. 2, p. 282-300.
Throckmorton, Peter and Kapitän, Gerhard, 1968, An ancient shipwreck at Pantano Longarini: Archaeology, v. 21, no. 3, p. 182-187.
Torr, Cecil, 1964, Ancient Ships: Chicago, Argonaut, 222 p.
Ucelli, Guido, 1950, Le Navi Di Nemi: Rome, La Libreria Dello Stato, 424 p.
Young, Jr., T. C., 1969, The Chronology of the late third and second milennia in central western Iran as seen from Godin Tepe: Am. Jour. Archaeol., v. 73, no. 3, p. 287-291.
Young, Jr., T. C. and Smith, P. E. L., 1966, Research in the Prehistory of central western Iran: Science, v. 153, no. 3734, p. 386-391.