

## UNIVERSITY OF PENNSYLVANIA RADIOCARBON DATES XVIII

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### INTRODUCTION

This date list includes most of the archaeologic samples dated in this laboratory since publication of our last date list (R, 1974, v 16, p 219-237), as well as some samples dated previously, which lacked adequate sample information. The BP ages are based on AD 1950, and have been calculated with the half-life value of 5568 yr. All samples were counted at least twice for periods of not less than 1000 min each. Errors quoted for each sample are derived from the measurement of the sample, the background, and several counts of our mid-19th century Oak sample, but do not include the 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 acid contaminants.

Our mid-19th century calibration samples have an average age of 139 yr. When corrected for this age, they have  $^{14}\text{C}$  contents equal to 95% of the NBS oxalic acid standard. The average  $^{13}\text{C}$  relationship between the Oak standard and the NBS limestone standard #20 is  $-25.7 \pm 1.3\text{‰}$  as measured on the Univ of Pennsylvania mass spectrograph.

The MASCA corrected dates, appearing in this date list, have been arrived at by applying appropriate correction factors to dates calculated with the 5730 half-life. For further explanation, see Univ of Pennsylvania Dates XVI (R, 1974, v 16, p 198-218) and Ralph *et al*, 1973.

I wish to thank Ray Costa and John Mayes for their careful work in processing these samples.

### SAMPLE DESCRIPTIONS

#### I. ARCHAEOLOGIC SAMPLES

##### A. Europe

##### 1. Czechoslovakia

##### Bohemian series

Late Bronze age and Early Iron age samples from Bohemia, Czechoslovakia, especially selected and subm by Evžen Neustupný, Československá Akad Věd, Prague, Czechoslovakia, in an attempt to minimize discrepancies between traditional archaeol chronology and corrected radiocarbon dates.

##### P-1902. Chodouny, Grave 7

**3080  $\pm$  60**

**1130 BC**

*MASCA corrected date: 1400-1450  $\pm$  70 BC*

Charcoal, Sample 2, from Grave 7, belonging to Phase D of Reincke's chronologic scheme for Central European Bronze age, in extensive cemetery of urn-graves of Late Bronze age, Lausitz culture, at Chodouny, N Bohemia, Litomeřice dist (59° 29' N, 14° 16' E), coll by

J Hrala. *Comment*: NaOH pretreatment. (EN): corrected date is 100 to 200 yr earlier than traditional estimates. Such a shift in absolute chronology would help to explain gap resulting from even more radical shift, of same direction, at beginning of Central European Bronze age.

*Dneboh-Hrada, N Bohemia, Turnov dist (50° 32' N, 15° 2' E)*. Samples coll 1957 by E Plesová from late phase of Lausitz culture of partially excavated Late Bronze age village.

**P-1904. Pit 300g** **3000 ± 50**  
**1050 BC**

*MASCA corrected date: 1300 ± 60 BC*

Charcoal, Sample 4, from Pit 300g. *Comment*: NaOH pretreatment.

**P-1905. Pit 355** **3030 ± 60**  
**1080 BC**

*MASCA corrected date: 1340-1370 ± 70 BC*

Charcoal, Sample 5, from Pit 355. *Comment*: NaOH pretreatment.

**P-1906. Radonice, Pit 1/61** **3050 ± 50**  
**1100 BC**

*MASCA corrected date: 1370-1390 ± 60 BC*

Charcoal, Sample 6, in fill of piriform storage pit, assoc with characteristic pottery and animal bones, from Late Bronze age village of Knovíz culture, NW Bohemia, Louny dist (55° 23' N, 13° 55' E). Samples coll by Evžen Neustupný (Bouzek *et al*, 1966).

*General Comment* (EN): P-1904-1906, all belong to same period immediately succeeding P-1902, and are 100 to 200 yr earlier than usually expected. Other unpub dates for same period: LJ-2091: 2940 ± 100; LJ-2042: 2810 ± 100; UCLA-1485-A: 2860 ± 60; UCLA-1485-B: 2900 ± 60; UCLA-1485-C: 2885 ± 60, may suggest that P-1904-1906 cover earlier part of Hallstatt A.

**P-1907. Vikletice, Hut 23** **2730 ± 60**  
**780 BC**

*MASCA corrected date: 940-980 ± 70 BC*

Charcoal, Sample 7, in fill of pit in Hut 23, of large scale rescue operation at Vikletice, NW Bohemia, Chomutov dist (50° 20' N, 13° 24' E) which has unearthed hundreds of objects from all periods of prehistory, including several clusters of semisubterranean houses, including Hut 23, of late (Štítary) phase of Knovíz culture (Hallstatt B 2) (Bouzek *et al*, 1966). Samples coll 1962 by Drahomír Koutecký. *Comment*: NaOH pretreatment. (EN): corrected date is ca 100 yr earlier than archaeol estimates. It is in correct relationship with other dates of this series.

*Provotín, S Bohemia, Písek dist (49° 12' N, 14° 13' E)*. Samples coll 1971 by A Beneš. One of 2 barrows excavated at Provotín contained a 3m × 3m log cabin with uncremated internment and rich grave goods

(more than 20 vessels, a bronze torque, iron knife, etc). Grave is typical of Hallstatt D period (early part) of Early Iron age.

**P-1908. Barrow 1**

**3010 ± 40**

**1060 BC**

*MASCA corrected date: 1300-1360 ± 50 BC*

Charcoal, Sample 8, Barrow No. 1, from uncharred beam in W part of grave chamber. *Comment:* NaOH pretreatment.

**P-1909. Barrow 1**

**2220 ± 60**

**270 BC**

*MASCA corrected date : 400 ± 70 BC*

Charcoal, Sample 9, Barrow 1, from charred beam in NE corner of grave chamber. *Comment:* NaOH pretreatment.

*General Comment (EN):* P-1908 coincided with dates for Hallstatt A, common in barrows of this area. Barrow from which samples were taken was erected on deserted settlement of Hallstatt A period. P-1909 seems too late and dates are incompatible with each other, considering that they both came from same funerary structure sealed by body of barrow.

*Manětín, W Bohemia, Pizen dist (50° 1' N, 13° 15' E).* Site is extensive cemetery from Early Iron age consisting of 3 types of graves: barrows, cremations in pits, and inhumations in pits. Barrows form earliest group of finds (Hallstatt D, early part), cremation burials contain pottery and metal equipment (Hallstatt D, late), and inhumations are connected with La Tène culture. Samples coll 1967 by E Soudská.

**P-1910. Grave 80**

**1150 ± 50**

**AD 800**

*MASCA corrected date: AD 850-830 ± 60*

Charcoal, Sample 10, from Grave 80, found among stones surrounding barrow grave, which consisted of small pit with sherds and cremated bones.

**P-1913. Grave 164**

**2630 ± 60**

**680 BC**

*MASCA corrected date: 820-840 ± 70 BC*

Charcoal, Sample 13, from fill of pit of Grave 164 (simple cremation) also containing an iron spear-head, 2 iron points, a bronze sheet, and hand-made pot. *Comment:* NaOH pretreatment.

**P-1914. Grave 173**

**2550 ± 50**

**600 BC**

*MASCA corrected date: 790 ± 60 BC*

Charcoal, Sample 14, from Grave 173 (cremation in pit) containing hand-made pot, 2 arm-rings, and blue beads. *Comment:* NaOH pretreatment.

*General Comment (EN):* P-1910 was too small for NaOH pretreatment and may have contained contaminating rootlets. No evidence exists that site was inhabited in 9th century AD. Graves of P-1913 and -1914 are archaeol very similar and almost identical radiocarbon dates fit into

relative sequence of this series, but their corrected age is unexpectedly high, suggesting error in traditional chronology (ca 6th century BC).

*Kadan, NW Bohemia, Chomutov dist (50° 23' N, 13° 18' E).* Excavation at Kadan revealed semisubterranean houses from Hallstatt D period and beginning of immediately following Early La Tène period. Excavation also unearthed N-most extent of direct imports from Greece (Late Black Figure pottery). Samples coll 1968 by V Kruta.

**P-1915. Pit 12** **1560 ± 50**  
**AD 390**

*MASCA corrected date: AD 410 ± 60*

Charcoal, Sample 16, from fill of Pit 12, ca 1m below modern surface. *Comment:* NaOH pretreatment. (EN): additional dates for same sample are MOC-27: 1560 ± 80, and MOC-34: 1580 ± 80 (personal commun). Because all 3 dates differ from expected age, finds from pit were inspected and found to contain undecorated sherds from possibly 5th century AD.

**P-1916. House 13** **2430 ± 50**  
**480 BC**

*MASCA corrected date: 530, 690-710 ± 60 BC*

Charcoal, Sample 17, House 13, from ca 1.4m below modern surface. *Comment:* NaOH pretreatment. (EN): one of possible corrected dates (530 BC) fits expectations exactly. Nearby archaeol feature contained fragment of imported Greek Black Figure pottery from end of 6th century BC. Date 530 BC suggests imported vessel was buried in Bohemia shortly after its production in Greece, not generations later as supposed by some archaeologists.

#### *B. Mediterranean*

##### *1. Italy*

##### **Casalini series**

Casalini (Artemesio), San Sosti, Italy (39° 35' N, 16° 20' E) is medieval site on top of mt in Calabria. Ruined church or sanctuary of Middle age was only building visible before excavation, which was done to find Iron age or Greek deposits. Samples coll 1970 by Marianne Maaskant; subm by Froelich Rainey, Dir, Univ Mus, Univ Pennsylvania, Philadelphia.

**P-1724. Trench 1 D** **1400 ± 50**  
**AD 550**

*MASCA corrected date: AD 590 ± 60*

Charcoal from Trench 1 D, depth 1m.

**P-1725. Trench 1 C, 1** **1200 ± 50**  
**AD 750**

*MASCA corrected date: AD 790-770 ± 60*

Charcoal from Trench 1 C, 1, depth 70 to 115cm.

**P-1726. Trench 1 C, 2****980 ± 50****AD 970***MASCA corrected date: AD 1000 ± 60*

Charcoal from Trench 1 C, 2, depth 1.15m. *Comment:* NaOH pre-treatment.

*General Comment (FR):* deepest deposit was alongside stone reservoir for rainwater. Reversal of strata probably occurred during refilling around original reservoir excavation, hence, reversal of <sup>14</sup>C dates.

**P-1999. Casa San Paola****7900 ± 100****5950 BC**

Casa San Paola, near Gravina, Apulia, S Italy (40° 50' N, 16° 45' E) is a Neolithic site. Charcoal and soil, from Trench N-B-2-1, Lot 7, depth 1.10m in cave in wall of caliche. Sample coll 1972 by Nancy Whitney; subm by G F Bass, Univ Mus, Univ Pennsylvania, Philadelphia. Expected date: 3300 to 3500 BC. *Comment:* date is beyond range of MASCA correction factors now available (Oct, 1974). See R, 1974, v 16, p 198-218 and Ralph *et al* (1973).

*2. Greece***Achilleion series**

Achilleion is a strat Neolithic site near Farsala, Thessaly, Greece (39° 17' N, 22° 23' E). Excavation uncovered 3 consecutive Early Neolithic phases, Thessalian Pre-pottery, Frükeramikum and Proto-Sesklo, and 4 Middle Neolithic phases, Sesklo, exceptionally rich in finds, including house, ovens, 204 sculptures, offering table, etc. Phases are numbered from top. Samples coll 1973; subm by Marija Gimbutas, Univ California at Los Angeles, Los Angeles.

*General Comment:* dates in this series are beyond range of MASCA correction factors now available (Oct, 1974). See R, 1974, v 16, p 198-218 and Ralph *et al* (1973).

**P-2130. Sample 10****7080 ± 90****5130 BC**

Charcoal, Sample 10, from SQ D, QD2, Level 7, Phase 1.

**P-2128. Samples 13 and 15****7270 ± 80****5320 BC**

Charcoal, Sample 13, Sq A, QD2-4, Level 8, and Sample 15, Sq A, QD3, Level 8, Phase 2.

**P-2125. Sample 74****6960 ± 90****5010 BC**

Charcoal, Sample 74, from Sq B, QD4, Level 13, Phase 3a.

**P-2124. Sample 69****7090 ± 90****5140 BC**

Charcoal, Sample 69, from Sq A, QD2, Level 14, Phase 3a. *Comment:* sample undersized, 96.01%.

- P-2123. Sample 62** **7450 ± 80**  
**5500 BC**  
Charcoal, Sample 62, from Sq A, QD3, Level 14, Phase 3a. *Comment:* NaOH pretreatment.
- P-2122. Sample 101** **7110 ± 90**  
**5160 BC**  
Charcoal, sample 101, from Sq B, QD2, Level 16, Phase 3b.
- P-2121. Sample 98** **7180 ± 90**  
**5230 BC**  
Charcoal, Sample 98, from Sq B, QD2, Level 17, Phase 3b. *Comment:* sample undersized, 88.89%.
- P-2120. Sample 88** **7340 ± 70**  
**5390 BC**  
Charcoal, Sample 88, from Sq A, QD1, Level 18, Phase 4.
- P-2117. Sample 113** **7270 ± 80**  
**5320 BC**  
Charcoal, Sample 113, from Sq A, QD1, Level 26, Phase 6.
- P-2118. Sample 115** **7470 ± 80**  
**5520 BC**  
Charcoal, Sample 115, from Sq B, QD2, Level 26, Phase 6.

**Franchthi Cave series**

Franchthi Cave (37° 26' N, 23° 8' E) is near W tip of high, rugged headland, directly across bay from village of Koilada near Porto Cheli in S Argolid, Peloponnese, Greece. Site is especially important for its apparently continuous strat sequence from Late Paleolithic through Mesolithic and the critical transition to Neolithic. There are no strat prehistoric remains beyond Late Neolithic. Samples coll 1973; subm by T W Jacobson, Indiana Univ, Bloomington, and M H Jameson, Univ Mus, Univ Pennsylvania, Philadelphia (Jacobsen, 1968; 1969a, 1969b, 1969c; 1973). For additional dates for this site, see R, 1971, v 13, p 364-367 and R, 1974, v 16, p 219-237.

*General Comment:* dates in this series are beyond range of MASCA correction factors now available (Oct, 1974). See R, 1974, v 16, p 198-218 and Ralph *et al* (1973).

- P-2093. F/A Balk, Unit 129S** **6940 ± 90**  
**4990 BC**  
Charcoal mixed with soil from F/A Balk, Unit 129S, relatively thin gray occupation layer, overlying P-1526, 8022 ± 76 and P-1527, 7897 ± 88 (R, 1971, v 13, p 366). Expected date: late Early Neolithic.
- P-2094. F/A Balk, Unit 143S** **7930 ± 100**  
**5980 BC**  
Charcoal mixed with sediments from F/A Balk, Unit 143S, near middle of relatively thick light gray occupation layer, below P-2093 (above).

**P-2095. F/A Balk, Unit 146S** **7980 ± 110**  
**6030 BC**

Charcoal mixed with sediments from F/A Balk, Unit 146S, at base of relatively thick gray occupation layer. Below P-2094 (above).

**P-2102. H-1, Quad B, Unit 126** **9290 ± 100**  
**7340 BC**

Charcoal mixed with sediments from H-1, Quad B, Unit 126, hearth deposit in reddish brown occupation layer, below P-1665,  $9477 \pm 134$ , and P-1666,  $8742 \pm 114$  (R, 1971, v 13, p 366). Date expected to be Mesolithic.

**P-2103. H-1, Quad B, Unit 139** **9300 ± 100**  
**7350 BC**

Charcoal mixed with sediments from H-1, Quad B, Unit 139, hearth deposit in reddish brown occupation layer, below P-2102 (above). Expected date: Mesolithic.

**P-2104. H-1, Quad B, Unit 139** **9270 ± 110**  
**7320 BC**

Charcoal from H-1, Quad B, Unit 139, coll by flotation in water-sieving device using mixture of fresh and sea water (Jacobsen, 1973, p 57; French, 1971). Date expected to be Mesolithic and comparable to P-2103 (above). *Comment:* NaOH pretreatment.

**P-2096. F/A Balk, Unit 177N** **8710 ± 100**  
**6760 BC**

Charcoal mixed with sediments from F/A Balk, Unit 177N, near top of layer with considerable crushed shell and animal bone, below, P-2095 (above). Expected date: Mesolithic, earlier than P-1526,  $8022 \pm 76$  (R, 1971, v 13, p 366) and comparable to P-2106 and -2107 (*cf.*). *Comment:* NaOH pretreatment.

**P-2106. F/A Balk, Unit 177N** **8730 ± 90**  
**6780 BC**

Charcoal from B/A Balk, Unit 177N, coll by flotation in water-sieving device (see P-2104, above). Expected date: Mesolithic, earlier than P-1526,  $8022 \pm 76$  (R, 1971, v 13, p 366) and comparable to P-2096 (above) and P-2107 (*cf.*). *Comment:* NaOH pretreatment.

**P-2107. F/A Balk, Unit 177N** **8530 ± 90**  
**6580 BC**

Charcoal from F/A Balk, Unit 177N, coll by hand sorting among fine residue settling at bottom of sieve box, rather than flotation (see P-2104, above). Date expected to be Mesolithic, earlier than P-1526,  $8022 \pm 75$  (R, 1971, v 13, p 366) and comparable to P-2096 and -2106 (above). *Comment:* NaOH pretreatment.

**P-2097. F/A Balk, Unit 197N** **9150 ± 100**  
**7200 BC**

Charcoal mixed with sediments from F/A Balk, Unit 197N, small hearth near base of rocky reddish occupation layer, below P-2096, -2106, and -2107 (above). Date expected to be Mesolithic.

**P-2108. F/A Balk, Unit 218N** **9250 ± 120**  
**7300 BC**

Charcoal from F/A Balk, Unit 218N, hearth deposit in dark brown occupation layer coll by flotation in water-sieving device (see P-2104, above). Expected date: Mesolithic. *Comment*: NaOH pretreatment.

### Halieis

Ancient city of Halieis is near modern village of Porto Cheli in S Argolid, Peloponnese, Greece. Site is partially submerged in shallow water. Wood id by R C Koeppen, Forest Prod Lab, U S Dept Agric, Madison, Wisconsin. Samples coll 1973 under water and subm by M H Jameson, Univ Mus, Univ Pennsylvania, Philadelphia (1969, 1973).

**P-2064. Sample 1** **1570 ± 50**  
**AD 380**

*MASCA corrected date: AD 400 ± 60*

Wood (*Pinus* sp) from Temple of Apollo, beneath floor, now ca-2m. *Comment* (MHJ): date probably later than destruction of temple, as there was Roman occupation in 4th century AD.

**P-2065. Sample 2** **3110 ± 50**  
**1160 BC**

*MASCA corrected date: 1460-1480 ± 60 BC*

Wood (*Abies* sp) from area enclosed by city walls, in possible harbor, under 2m mud, -4.5m.

**P-2066. Sample 3** **2510 ± 50**  
**560 BC**

*MASCA corrected date: 780 ± 60 BC*

Charcoal (*Pistacea* sp) from beneath tile fall of final destruction of building, in middle room. Possible fragments from single roof beam, under ca .3m mud, ca -1.75m. *Comment*: NaOH pretreatment.

**P-2067. Sample 4** **2460 ± 60**  
**510 BC**

*MASCA corrected date: 660-730 ± 70 BC*

Charcoal, hard wood (perhaps *Olea* sp) from occupation level of middle room of temple under .3m mud, ca -1.75m.

**P-2098. Olive pits** **1680 ± 50**  
**AD 270**

*MASCA corrected date: AD 280 ± 60*

Stones (*Olea europae*) and possibly other fruit stones and nut shells from under rubble wall N of city wall, -4.85m. From same area as P-2065 (above).



**P-2099.** **1820 ± 50**  
**AD 130**  
*MASCA corrected date: AD 150 ± 60*  
 Charcoal lumps separated from sample P-2098 (above).

**P-1784. Kato Zakro** **2870 ± 60**  
**920 BC**  
*MASCA corrected date: 1110 ± 70 BC*

Charcoal from Kato Zakro, coast of E Crete (35° 10' N, 26° 15' E), from NE entrance of palace believed to be MM IIIB to LM IA. Sample coll 1969 by Platon (1971), Univ Thessaloniki, Greece; subm by Leon Pomerance. *Comment:* NaOH pretreatment. (NEP): date expected to be 1600 to 1500 BC, based on manifold correspondence with Egypt and Orient.

### *C. Near East*

#### *1. Egypt*

**P-2049. Nile Delta** **5010 ± 70**  
**3060 BC**  
*MASCA corrected date: 3780 ± 90 BC*

Carbonaceous silt enclosing skull of *Hippopotamus amphibius*, N-most occurrence in Nile valley, from Nile Delta, Egypt (30° 56' N, 31° 57' E). Sample coll from excavation 4m below surface by Darwish Alfar, dir Geol Mus Cairo, Egypt; subm by Robert Giegengack. *Comment:* NaOH pretreatment.

#### *2. Turkey*

**P-2041. Acem Höyük** **3500 ± 50**  
**1550 BC**  
*MASCA corrected date: 2000-2020 ± 60 BC*

Charcoal from storage building contemporary with palace at Acem Höyük, a large Bronze age mound NW of Aksaray in central Turkey (38° 30' N, 33° 55' E). Sample coll 1971 by Nimet Özgüç, Univ Ankara, Turkey; subm by M J Mellink (Özgüç, 1968). For additional dates see: P-1555, 3611 ± 49 and P-1595, 3391 ± 58 (R, 1971, v 13, p 371-372). *Comment:* NaOH pretreatment.

#### **Aphrodisias series**

Aphrodisias, Turkey (37° 43' N, 28° 48' E) is ca 153km SE of Izmir and 129km E of ancient port of Miletus. Samples are from "Acropolis" and "Pekmez" mounds within larger area enclosed by Hellenistic/Roman walls of later classical site. "Acropolis" mound consists of Early and Middle Bronze age levels and evidence of later periods up to Ottoman times. "Pekmez" mound to W consists of Chalcolithic levels overlain by Early Bronze Age I and II materials, as well as more recent materials. Samples coll 1967 and 1970; subm by Karen Flinn and Barbara Kadish, New York Univ, New York (Kadish, 1969, 1971). For additional dates see R, 1971, v 13, p 369-371.

*"Acropolis" mound*

**P-1774. Trench 3, Unit 228** **3800 ± 60**  
**1850 BC**

*MASCA corrected date: 2190, 2230-2290 ± 70 BC*

Wood charcoal from hearth pit in Rm 2, Structure A, Complex II.

**P-1775. Trench 3, Unit 228** **3800 ± 50**  
**1850 BC**

*MASCA corrected date: 2190, 2230-2290 ± 60 BC*

Wood charcoal from bottom of hearth pit in Rm 2, Structure A, Complex II. *Comment:* NaOH pretreatment.

*"Pekmez" mound*

**P-2029. Trench 2, Test Trench B** **5450 ± 80**  
**3500 BC**

*MASCA corrected date: 4830 ± 90 BC*

Charcoal, Unit 1589d, from lens of heavily blackened earth. Depth -6.55m below subdatum. *Comment:* NaOH pretreatment. (KF & BK): pottery of this level compares typologically with Late Chalcolithic period at Beycesultan; artifacts are similar to those of Chalcolithic Levels XVI, XV, and XII at Mersin.

**P-2030. Trench 2, Test Trench B** **4860 ± 80**  
**2910 BC**

*MASCA corrected date: 3690 ± 90 BC*

Charcoal, Unit 1589d, from lens of heavily blackened earth. Depth -6.55m below subdatum. *Comment* (KF & BK): no NaOH pretreatment may account for different date from P-2029 (above).

**P-2031. Trench 2, Test Trench B** **5280 ± 70**  
**3330 BC**

*MASCA corrected date: 4100, 4180 ± 80 BC*

Ash and wood charcoal, Unit 1599a and b, from clayey, gray-brown earth. Depth -7.97m below subdatum.

**P-2040. Sakyol, Pulur** **4610 ± 70**  
**2660 BC**

*MASCA corrected date: 3390, 3440 ± 80 BC*

Charcoal from Level XI, Sakyol, Pulur, Keban area, E Turkey (38° 52' N, 39° 7' E) ca 45km NW of Elâzig. Coll 1970 by Hamit Koşay (1970), Ethnographic Mus, Ankara, Turkey; subm by M J Mellink. Expected date: Early Bronze age, 1st half of 3rd millennium BC.

*D. Middle East**1. Pakistan***Gumla series**

Gumla is a low, Bronze age mound between village of Gumla to N and Garhi Hayat to S, Dera Ismail Khan Dist, W Pakistan (31° 44' N, 70° 47' E). Samples coll 1971 and subm by A H Dani, Univ Islamabad, Pakistan (1973).

**P-1810. Circle Grave 1** **4340 ± 60**  
**2390 BC**

*MASCA corrected date: 3110-3140 ± 70 BC*

Charcoal, Sample 1 from Circle Grave 1, Period V, found with human bones. *Comment:* NaOH pretreatment. (AHD): expected date: 1600 to 2100 BC.

**P-1812. Trench BO, Layer 11** **4080 ± 70**  
**2130 BC**

*MASCA corrected date: 2700, 2740, 2820 ± 80 BC*

Charcoal, Sample 3, from Trench BO, Layer 11, Period II. *Comment:* NaOH pretreatment. (AHD): expected date: 3000 to 3500 BC.

**P-1882. Location AO, Stratum 11** **4210 ± 150**  
**2260 BC**

*MASCA corrected date: 2930-2950 ± 160 BC*

Charcoal from Loc AO, Stratum 11. *Comments:* sample undersized for Univ Pennsylvania counters; gas was sent to Isotopes, Inc for counting as I-6694 (85.9% in Isotopes counter). (AHD): expected date: 3000 to 3500 BC.

*General Comment* (AHD): much earlier dates expected for P-1812 and -1882 and much later dates for P-1810 and -1813 (*cf.*).

**P-1813. Hathala** **4040 ± 60**  
**2090 BC**

*MASCA corrected date: 2630-2680 ± 70 BC*

Hathala is a Bronze age mound, ca 27.4km S of Tank, Dera Ismail Khan Dist, W Pakistan (32° 1' N, 70° 32' E). Sample consisted of charcoal and ash mixed with earth from Trench Y, Layer 2; coll 1971 and subm by A H Dani, Univ Islamabad, Pakistan (1973). *Comment* (AHD): much later date expected: 1600 to 2100 BC.

*E. Africa*

*1. Cameroon*

**Douloumi series**

Douloumi is Iron age mound with ca 4m cultural strat, on Lake Douloumi in N Cameroon (9° 12' N, 13° 39' E). Samples coll 1969 by Frank Bartell; subm by N C David, Univ College London, England. For additional dates from site, see: P-1761, 1089 ± 41; P-1763, 1074 ± 47; and P-1764, 1412 ± 50 (R, 1973, v 15, p 376-377).

**P-1760. Strat Units 3 and 4** **220 ± 50**  
**AD 1730**

*MASCA corrected date: AD 1640 ± 60*

Charcoal and soil from Strat Units 3 and 4 of 2nd arbitrary level of Iron age assemblage. *Comment:* NaOH pretreatment.

**P-1762. Strat Units 15 and 16****1030 ± 50****AD 920***MASCA corrected date: AD 950 ± 60*

Charcoal and soil from Strat Units 15 and 16 of 8th arbitrary level of Iron age assemblage.

*F. Arctic**1. Alaska***P-2090. St Lawrence I Eskimo cadaver****1610 ± 80****AD 340***MASCA corrected date: AD 390-370 ± 90*

Muscle tissue from leg and abdominal cavity of frozen human body washed out of cliff face by landslide in area of Kialegak SE Cape, St Lawrence I, Alaska (63° 30' N, 169° 20' W). Body was in tightly flexed position, with tattoo on dorsal aspect of lower right forearm, consisting of alternating pattern of lines and dots. Sample coll May 1973 by Z A Bradley, Natl Park Service; subm by M R Zimmerman, Depts Pathol & Anthropol, Univ Pennsylvania, Philadelphia. *Comment:* after normal acid pretreatment, sample was put in oven (110°C); rather than drying, sample became gelatinous. It was then pyrolyzed in a N<sub>2</sub> atm before combustion. After pyrolysis, sample was too small for Univ Pennsylvania counters; it was sent to Isotopes, Inc for processing and counting. A better procedure for handling such a sample would have been first N<sub>2</sub> pyrolysis and then acid treatment. Additional date for same cadaver: SI-1656, 1550 ± 70 (personal commun). (MRZ): frozen for 1600 yr, cadaver allowed unique opportunity for radiocarbon dating human tissue. Tissues were extremely well preserved, indicating body was frozen since death. Individual was elderly woman who appears to have suffered accidental inhumation, as distal air passages were packed with aspirated sod. Post-mortem exam also revealed coronary artery disease and chronic fungal infection (id in progress). Microscopic exam confirmed suffocation as cause of death.

**Feniak Lake series**

Feniak Lake site is .8km N of SE corner of Feniak Lake, USGS Howard Pass Quadrangle, Noatak drainage, N Alaska (68° 14' N, 158° 16' W). Site contains 1st known winter house from N Alaska interior, relating to well-known Ipiutak culture. Cultural finds are abundant, consisting of over 1200 recognizable artifacts, all assoc with single house. Lithic inventory is identical to that found at Point Hope Ipiutak site, but organic artifact types are almost completely dissimilar, suggesting differential Ipiutak winter/summer tools (assuming that Point Hope represents a summer Ipiutak sta) or regional variation. Samples coll 1972 and subm by E S Hall, Jr, State Univ New York at Brockport, Brockport, New York (1972; Anderson, 1968; Campbell, 1962; Giddings, 1967; Irving, 1962, 1964; Larsen, 1955, 1968; Larsen and Rainey, 1948; Rainey, 1971).

**P-2056. Sample A****2220 ± 50****270 BC***MASCA corrected date: 400 ± 60 BC*

Sample A, from flooring, composed of small twigs (probably *Salix*) assoc with cultural material typical of site. *Comment:* NaOH pretreatment.

**P-2057. Sample B****1960 ± 50****10 BC***MASCA corrected date: AD 50-30 ± 60*

Sample B, House wall Post F (probably *Picea*). *Comment* (ESH): house is of form not previously known for Ipiutak, though archaeol evidence strongly indicates house is directly assoc with Ipiutak cultural material.

**P-2058. Sample C****1570 ± 50****AD 380***MASCA corrected date: AD 400 ± 60*

Sample C, flooring composed of small twigs (probably *Salix*), ca 1.8m from Sample A.

**P-2143. Sample E****1530 ± 50****AD 420***MASCA corrected date: AD 440 ± 60*

Sample E, house fill consisting of bark (*Betula* and fragments of *Picea*). *Comment:* NaOH pretreatment.

**P-2143-A. Sample E****1530 ± 50****AD 420***MASCA corrected date: AD 440 ± 60*

Sample E. *Comment:* same as P-2143, above, but no NaOH pretreatment.

**P-2144. Sample F7****1320 ± 50****AD 630***MASCA corrected date: AD 650 ± 60*

Sample F7 (probably *Picea*), from construction features mainly along house wall in floor fill. *Comment:* NaOH pretreatment.

**P-2145. Sample G****1360 ± 40****AD 590***MASCA corrected date: AD 620 ± 50*

Sample G, bark (*Betula* and fragments of *Picea*). *Comment:* NaOH pretreatment.

**Onion Portage series**

Onion Portage is a strat archaeol site on Kobuk R, NW Alaska (67° 10' N, 158° 30' W), comprising > 70 distinct cultural layers. Site has complex depositional history spanning ca 10,000 yr of occupation, combining varve-like flood deposits, storm-derived aeolian deposits, and thick colluvial deposits, in addition to culturally derived materials. Organic preservation is mostly poor, and occupation horizons are marked

by thin continuous layers of charcoal, but no organic middens. Faunal remains are scarce, except for "yellowish" stains embedded in cultural strata. Cultural layers are sorted into tight clusters called bands, separated by thick colluvia derived from gullying activity on hillside immediately N of site. Interband colluvium decreases in thickness toward river edge. A levee of alternating silt and sand has built up along river edge of site. Separation of occupation levels is greatest on levee and strat units are numbered from secs from this area. In some cases occupation levels merge in higher part of site to N.

Bands 1 to 8 are numbered from top to bottom; occupation levels within each band are also numbered from top to bottom. Cultural and temporal gaps between deposition units indicate that deposits occurred at irregular rate. Samples coll 1961, 1964; subm by J L Giddings. Samples coll 1965, 1966; subm by D D Anderson, Brown Univ, Providence, Rhode Island (1968, 1970a, b, c; Giddings, 1952, 1962, 1965, 1967; Hamilton, 1970).

*Band 1: Arctic Woodland Eskimos*

**P-593-A. House 5** **920 ± 50**  
**AD 1030**

*MASCA corrected date: AD 1040 ± 70*

Charcoal from floor of House 5, probably Eksaevik phase, coll 1961 (Giddings, 1952). *Comments:* NaOH pretreatment. Rootlets removed by hand. (DDA): date probably too early.

**P-1112. House 13** **900 ± 50**  
**AD 1050**

*MASCA corrected date: AD 1060 ± 60*

Wood from floor of House 13, probably early Ahteut phase, coll 1965. *Comment:* NaOH pretreatment.

**P-1064. House 13** **1490 ± 50**  
**AD 460**

*MASCA corrected date: AD 530-490 ± 60*

Wood from charcoal from floor of House 13, probably early Ahteut phase; coll 1965. *Comments:* NaOH pretreatment. Rootlets removed by hand. (DDA): date probably too early.

*Band 2: Levels 1 to 4 are Itillik complex, Levels 5 to 12 are Ipiutak or Norton related.*

**P-594-A. Band 2** **1380 ± 60**  
**AD 570**

*MASCA corrected date: AD 600 ± 70*

Charcoal from one of lower levels, Band 2, coll 1961. *Comment:* NaOH pretreatment.

**P-1065. Band 2** **1570 ± 50**  
**AD 380**

*MASCA corrected date: AD 400 ± 60*

Charcoal and sand from one of lower levels of Band 2; coll 1965.

*General Comment:* other dates from Band 2: K-836,  $1570 \pm 140$  (R, 1968, v 10, p 320); GX-1503,  $1350 \pm 80$ ; GX-1502,  $1440 \pm 110$  (pers commun).

*Band 3: Choris culture*

**P-1066. Band 2/3** **2370  $\pm$  50**  
**420 BC**

*MASCA corrected date:  $470 \pm 60$  BC*

Charcoal from hearth in isolated cultural level between Bands 2 and 3; coll 1965. *Comment:* NaOH pretreatment. Rootlets removed by hand.

**P-1067. Band 3, top level** **2430  $\pm$  50**  
**480 BC**

*MASCA corrected date:  $510-540, 570-660 \pm 60$  BC*

Charcoal and sand from hearth in top level of Band 3, coll 1965. *Comment:* NaOH pretreatment.

**P-591-A. Band 3** **2450  $\pm$  60**  
**500 BC**

*MASCA corrected date:  $660-720 \pm 70$  BC*

Charcoal from upper level of Band 3, probably Level 2, coll 1961. *Comment:* NaOH pretreatment. Rootlets removed by hand.

*General Comment:* other dates from Band 3: upper level, K-832,  $2750 \pm 140$ ; "bottom" of Band 3, probably Level 5, K-835,  $3170 \pm 120$  (R, 1968, v 10, p 320); Level 2, GX-1504,  $1250 \pm 90$ ; Level 5, GX-1505,  $1010 \pm 100$  (pers commun).

*Band 4: Denbigh Flint Complex*

**P-1068. Band 3/4** **3530  $\pm$  60**  
**1580 BC**

*MASCA corrected date:  $2050 \pm 70$  BC*

Charcoal and sand from isolated level between Bands 3 and 4, coll 1965. *Comment:* NaOH pretreatment. Rootlets removed by hand.

**P-1069-A. Band 4, Level 1** **3640  $\pm$  60**  
**1690 BC**

*MASCA corrected date:  $2120-2140 \pm 70$  BC*

Charcoal and sand from hearth in Band 4, Level 1, Classic Denbigh; coll 1965. *Comment:* rootlets removed by hand.

**P-987. Band 4, Level 2** **3860  $\pm$  70**  
**1910 BC**

*MASCA corrected date:  $2350-2370, 2430-2460 \pm 80$  BC*

Charcoal and sand from hearth in Band 4, Level 2, Classic Denbigh; coll 1964.

**P-1109. Band 4, Level 3** **3700  $\pm$  60**  
**1750 BC**

*MASCA corrected date:  $2160 \pm 70$  BC*

Charcoal and sand from hearth in Band 4, Level 3, Classic Denbigh; coll 1965. *Comment:* NaOH pretreatment.

**P-988. Band 4, Level 4** **3850 ± 70**  
**1900 BC**

*MASCA corrected date: 2560 ± 80 BC*

Charcoal and sand from Band 4, Level 4, Classic Denbigh; coll 1964.

**P-998. Band 4/5** **3950 ± 70**  
**2000 BC**

*MASCA corrected date: 2560 ± 80 BC*

Charcoal and sand from hearth between Bands 4 and 5, Classic Denbigh; coll 1964.

*Band 5: Level 1, Proto-Denbigh; Levels 2 to 3, Portage complex*

**P-1070. Band 5, Level 1** **3710 ± 60**  
**1760 BC**

*MASCA corrected date: 2160 ± 70 BC*

Charcoal and sand from house hearth, Band 5, Level 1, Proto-Denbigh; coll 1965. *Comment: NaOH pretreatment.*

**P-1071. Band 5, Level 1** **3710 ± 60**  
**1760 BC**

*MASCA corrected date: 2160 ± 70 BC*

Charcoal and sand from hearth in Band 5, Level 1, Proto-Denbigh; coll 1965. *Comment: NaOH pretreatment.*

**P-1072. Band 5, Level 2** **4270 ± 70**  
**2320 BC**

*MASCA corrected date: 2970-2990 ± 80 BC*

Charcoal and soil from hearth in Band 5, Level 2, Portage complex; coll 1965.

**P-1030-A. Band 5, Level 3** **4340 ± 70**  
**2390 BC**

*MASCA corrected date: 3110-3140 ± 180 BC*

Charcoal and sand from Band 5, Level 3, Portage complex; coll 1964. *Comment: NaOH pretreatment.*

**P-1031. Band 5, Level 3** **4010 ± 70**  
**2060 BC**

*MASCA corrected date: 2610 ± 80 BC*

Charcoal and sand from Band 5, Level 3, Portage complex; coll 1964.

**P-1032. Band 5, Level 3** **3940 ± 70**  
**1990 BC**

*MASCA corrected date: 2560 ± 80 BC*

Charcoal and sand from hearth in Band 5, Level 3, Portage complex; coll 1964.



**P-1073. Band 5/6** **3530 ± 100**  
**1580 BC**

*MASCA corrected date: 2050 ± 110 BC*

Charcoal from hearth in isolated level between Bands 5 and 6, transition between Portage and Palisades complexes; coll 1965. *Comments:* undersized sample, 56.88%. (DDA): date too recent.

**P-1110. Band 5/6** **3200 ± 60**  
**1250 BC**

*MASCA corrected date: 1520-1560 ± 70 BC*

Charcoal and soil from hearth in isolated level between Bands 5 and 6, transition between Portage and Palisades complexes; coll 1965. *Comment* (DDA): date too recent. GX-1506, 3690 ± 200 (pers commun) is also too recent.

**P-999. Band 5/6** **4250 ± 60**  
**2300 BC**

*MASCA corrected date: 2970 ± 70 BC*

Charcoal from isolated level between Bands 5 and 6, transition between Portage and Palisades complexes; coll 1964. *Comment:* NaOH pretreatment.

*Band 6: Palisades Complex, Levels 1 to 13*

**P-1074. Band 6, Level 1** **4120 ± 80**  
**2170 BC**

*MASCA corrected date: 2850 ± 90 BC*

Charcoal and sand from hearth in Band 6, Level 1; coll 1965. *Comment:* NaOH pretreatment. Undersized sample, 83.97%.

**P-1026. Band 6, Level 7** **4640 ± 70**  
**2690 BC**

*MASCA corrected date: 3400, 3430, 3470 ± 80 BC*

Charcoal and sand from hearth in Band 6, Level 7; coll 1964. *Comment:* NaOH pretreatment.

**P-1075. Band 6, Level 8** **5320 ± 80**  
**3370 BC**

*MASCA corrected date: 4210-4250 ± 90 BC*

Charcoal and sand from hearth in Band 6, Level 8; coll 1965.

**P-1027. Band 6, Level 12** **5110 ± 70**  
**3160 BC**

*MASCA corrected date: 3900-3920 ± 80 BC*

Charcoal and sand from Band 6, Level 12; coll 1964.

**P-981. Band 6, Level 12** **5070 ± 70**  
**3120 BC**

*MASCA corrected date: 3850-3880 ± 80 BC*

Charcoal and sand from hearth in Band 6, Level 12; coll 1964.

**P-982. Band 6, bottom level****5270 ± 70****3320 BC***MASCA corrected date: 4100, 4160-4180 ± 80 BC*

Charcoal and sand from hearth in Band 6, bottom level; coll 1964.  
*Comment:* NaOH pretreatment.

*General Comment:* other dates from Band 6: Level 13, GX-1507, 5020 ± 150; lowest level, or Band 7, Level 3, GX-0261, 5680 ± 160 (pers commun).

*Band 8: Kobuk complex*

*General Comment:* Band 8 dates are beyond range of MASCA correction factors now available (Oct, 1974). See R, 1974, v 16, p 198-218 and Ralph *et al* (1973).

**P-984-A. Band 8, Level 1****7920 ± 100****5970 BC**

Charcoal and sand from hearth in Band 8, Level 1; coll 1964.

**P-985. Band 8, Level 1****8100 ± 160****6150 BC**

Charcoal and sand from Band 8, Level 1; coll 1964. *Comment:* NaOH pretreatment. Sample undersized, 53%, diluted with anthracite.

**P-1076. Band 8, Level 1****7900 ± 100****5950 BC**

Charcoal and soil from hearth in Band 8, Level 1; coll 1965. *Comment:* NaOH pretreatment.

**P-1111. Band 8, Level 1****7180 ± 90****5230 BC**

Charcoal and soil from hearth in Band 8, Level 1; coll 1965. *Comment* (DDA): date too recent.

**P-1111-A. Band 8, Level 1****7320 ± 100****5370 BC**

Same as P-1111, above. *Comment:* NaOH pretreatment. (DDA): date too recent.

*General Comment:* other date for Band 8: Level 3, GX-1508, 8195 ± 290 (pers commun).

*Below Band 8: Akmak complex*

*General Comment:* see K-1583, 9570 ± 150 (R, 1973, v 15, p 107).

## II. GEOLOGIC SAMPLES

*Arctic***Kobuk area peat samples**

Peat samples from lakes near Onion Portage archaeol site (see above) on Kobuk R, NW Alaska (67° 10' N, 158° 30' W), coll 1965 by Sten Florin; subm by D D Anderson.

**P-1093. Onion Lake****4230 ± 90****2280 BC***MASCA corrected date: 2950-2970 ± 100 BC*

Peat (*gyttja*) from lake bed core, 205 to 215cm below surface of Onion Lake, near Onion Portage. Coll 1965 by Sten Florin. *Comment:* undersized sample, 70.20%.

**P-1094. Ishrakaklik Lake****6150 ± 50****4200 BC***MASCA corrected date: 5100 ± 60 BC*

Peat (*gyttja*) from lake bed core, 140 to 150cm below surface of Ishrakaklik Lake, NW of Onion Portage. Coll 1965 by Sten Florin.

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