

GRONINGEN RADIOCARBON DATES V

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INTRODUCTION

This date list mainly contains results obtained for archaeological samples which were measured in the Groningen laboratory in the course of the years and which have not hitherto been published in a similar form. As such it is an extension of the previous date list (Groningen IV) and reference is made to this publication for information on the method of presentation, the corrections applied, etc. Samples which are primarily of geological significance will be presented separately in next year's list.

All samples were pretreated with hot dilute hydrochloric acid to remove carbonates and mobile organic material. In cases where, in addition, a humic acid extraction was performed with hot dilute sodium hydroxide it is explicitly mentioned in the text.

It should be pointed out that the C^{13}/C^{12} ratios of the samples have not been measured and that consequently the dates have not been adjusted to correct for variations in the C^{14}/C^{12} ratio due to isotope fractionation. With few exceptions the variations in the initial C^{14} content of plant material does not exceed $\pm 1\%$ so that the error introduced is less than 80 yr. If users of the dates prefer to incorporate this additional uncertainty in the statistical error it can be done by using the formula

$$\bar{\sigma} = \sqrt{\sigma^2 + 40^2}$$

where σ is the statistical uncertainty attached to the date in the list.

Sample descriptions and comments have been compiled on the basis of written communications by the submitters. Usually only one recent reference to literature is given.

SAMPLE DESCRIPTIONS

I. OLD WORLD ARCHAEOLOGY

A. Paleolithic

GrN-2640. Al Ghab, Syria > **53,000**

Peaty clay with charcoal underlying fluvial clays with gravel and a Late Levallousian flint industry at Al Ghab (39.70° N Lat, 40.35° E Long), near Karkour, Syria (Van Liere, 1960-1961), depth 5 m. African fauna elements are lacking in the fluvial clays, which therefore must be later than beginning of Würm period. Peat would correspond to first Würm interstadial. Coll. 1959 and subm. by W. J. van Liere, P. O. Box 256, Damascus, Syria. *Comment*: the infinite date is quite satisfactory for this early Würm oscillation.

GrN-2556. Ras el-Kelb, Lebanon > **52,000**

Charred bone from a Levallous-Mousterian culture layer (breccia) in cave of Ras el-Kelb (33° 58' N Lat, 35° 34' E Long), near Beirut, Lebanon

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(Garrod, 1956), depth 4.65 to 6.00 m. Age is expected to be about the same as that of Et Tabun C (GrN-2729: $40,900 \pm 1000$ in Groningen IV). Coll. 1939 by D. A. E. Garrod and G. Henri-Martin; subm. by D. A. E. Garrod, Villebois-Lavalette, Charente, France. *Comment*: no explanation for the difference between the Et Tabun and Ras el-Kelb dates.

Gorham's Cave series, Gibraltar

In 1957 two charcoal samples were dated from Gorham's Cave, Gibraltar ($36^{\circ} 08' N$ Lat, $5^{\circ} 18' W$ Long) (Waechter, 1951; Zeuner, 1953). Because of the importance of this site two new samples were collected and measured in 1958 to obtain more precise dates. Coll. by K. P. Oakley and Mrs. C. Tipp; subm. by K. P. Oakley, British Mus. (Nat. History), London.

GrN-1363. Gorham's Cave D $27,860 \pm 300$
 $25,910$ B.C.

GrN-1455. Gorham's Cave D (new sample) $28,700 \pm 200$
 $26,750$ B.C.

Charcoal from Layer D containing Upper Paleolithic (Aurignacian) industry. *Comment*: occupation occurred during last of three low sealevel periods presumably belonging to last glaciation.

GrN-1556. Gorham's Cave G $49,200 \pm 3200$
 $47,250$ B.C.

GrN-1473. Gorham's Cave G (new sample) $47,700 \pm 1500$
 $45,750$ B.C.

GrN-1678. Gorham's Cave G "humus" fraction $>47,000$

Charcoal from Layer G, uppermost Mousterian layer, with large amount of flakes and implements. *Comment*: sedimentation took place during second of low sealevel phases: GrN-1678 is the humus fraction of GrN-1473.

General Comment: GrN-1363 was only pretreated with acid; the humus was removed from the other three samples by treatment with acid and alkali.

GrN-2488. Devil's Tower No. 3, Gibraltar $>30,000$

Small sample from Devil's Tower shelter approx. 1 km N of Gorham's Cave (see above) at Gibraltar ($36^{\circ} 08' N$ Lat, $5^{\circ} 18' W$ Long). Coll. by Prof. Garrod; subm. 1961 by K. P. Oakley. *Comment*: associated industry is Upper Mousterian and closely resembles that of Layer G in Gorham's Cave (GrN-1473). Because sample was small it was only pretreated with acid. Even then quantity of gas was insufficient for more precise measurement.

Kalambo Falls series, Northern Rhodesia

Kalambo Falls ($08^{\circ} 35' S$ Lat, $31^{\circ} 15' E$ Long) are at SE end of Lake Tanganyika on territorial boundary between Northern Rhodesia and Tanganyika. In a small basin above falls are three main series of sediments forming three terrace features at ca. 20 m, 10 m, and ca. 5 m above the river. These contain a nearly continuous cultural sequence from end of Earlier Stone Age (Late Acheulian) up to present day. Excavations carried out since 1953 by J. D. Clark of Rhodes-Livingstone Mus., now of Dept. of Anthropol., Univ. of California, Berkeley, have exposed a series of well-stratified living floors,

stream, lake and swamp sediments, and erosion surfaces with a wealth of associated cultural remains (Clark, 1954, 1962). Oldest surfaces and floors contain wooden as well as stone artifacts and evidence of fire-using. E. M. van Zinderen Bakker was able to detect in the pollen climatic variations which represent a pre-Gamblian wet period (Late Kanjeran ?), the Gamblian, and the Holocene. C¹⁴ dates indicate that time span involved is from early Würm onwards. Results obtained from these samples confirm and extend range of dates obtained by Broecker and Kulp (Lamont V). Samples coll. during 1959 excavations and subm. by J. D. Clark in 1959, except where otherwise stated.

GrN-3189. Kalambo Falls 1/59R **370 ± 50**
A.D. 1580

Charcoals at 60 to 90 cm depth in Iron Age clay from Site B2 representing closing stages of Kalambo Culture (Channelled Ware pottery). Expected age not later than A.D. 1400. *Comment:* due to known variation in C¹⁴ content of atmosphere during this time, age of ca. A.D. 1350 also possible.

GrN-3580. Kalambo Falls 4/59R **930 ± 40**
A.D. 1020

Charcoals at 2.1 m depth in Iron Age clay at Site B2 associated with Channelled Ware pottery. Expected age A.D. 1000. *Comment:* date compares well with L 395B: 1080 ± 180 from Site A1 (Lamont V).

GrN-3196. Kalambo Falls 11/59R **40,600 ± 1300**
38,650 B.C.

Charcoal flecks and small fragments in gray sand 15 cm below main (Middle Stone Age) stone line in Trench A4 representing later stages of typical Sangoan Culture (First Intermediate Period). Clay bank covering GrN-3226 had been cut out here by erosion. Pollen evidence indicates climate was cooler and wetter than in immediately following stages. *Comment:* sample was carefully pretreated with acid and alkali.

GrN-3226. Kalambo Falls 16/59R **46,100 +3500**
-2400
44,150 B.C.

Small sample of charcoal below clay bank in fine white sand in Trench A4 stratigraphically of same age as previous sample (GrN-3196). *Comment:* too little C was present for a full sample and no more exact age could be measured. The two dates are, however, not inconsistent. Fully pretreated for humic-acid removal.

GrN-3228. Kalambo Falls 5/59R **37,900 +1500**
-1200
35,950 B.C.

Small sample of wood in coarse sand 1.5 m under main (Middle Stone Age) stone line and over gravel stringer containing Sangoan waste. Since Sangoan sediments are characterized by much cutting and filling and culture is conservative, it is difficult to correlate the succession on the different sites. *Comment:* pretreated for humic acid extraction. Sample dates lower levels of Sangoan at Site B. This and following samples GrN-3237 and GrN-3608 should probably be older than previous two, but as all lie within statistical error no

definite conclusion can be drawn as to length of time-lapse. One other finite date for Sangoan Culture at Kalambo has been reported by Lamont: L-399C: $43,000 \pm 3000$ (Lamont V), in good agreement with above figures.

GrN-3237. Kalambo Falls 8/59R **42,000 \pm 2000**
40,050 B.C.

Wood fragments in sterile lower coarse sand 2.3 m under main (Middle Stone Age) erosion surface at Site B2. Sangoan artifacts (middle to lower stages ?) occur sporadically in gravel stringers at this depth. *Comment*: fully pretreated for humic acid removal.

GrN-3608. Kalambo Falls 18/59R **> 32,600**

Small sample of charcoals 4 m below clay bank in Trench A4 from dark grey clay containing Sangoan artifacts. *Comment*: too little C remained after pretreatment to give full sample.

GrN-3211. Kalambo Falls 26/59R **> 49,000**

Wood immediately over lower clay layers and from lowest Sangoan level in Trench A4. *Comment*: fully pretreated for humic acid removal. Date appears old for Sangoan and it is possible that wood might have been derived from clays on which it was lying and which in 1963 excavations at Site A were associated with a transitional Acheulian-Sangoan industry.

GrN-1396. Kalambo Falls /57 **> 52,000**

GrN-2644. Kalambo Falls /57, enriched **57,600 \pm 750**
55,650 B.C.

Log of well-preserved wood from Floor 6 at Site A1, 6.7 m below surface, associated with late Acheulian industry (handaxes, cleavers and flake tools) which preceded Sangoan at this site. Subm. in 1957. *Comment*: both samples were fully pretreated with acid and alkali to remove humic acids. C^{14} in GrN-2644 was *enriched* by a factor of 8.7 before measurement (Haring and others, 1958). C^{14} concentration was 0.07% of that of modern C. The uncertainty in the enrichment factor is included in the standard error given. Date would place culture in early stages of last Glacial Period. As no major stratigraphical break could be observed between these Acheulian floors and overlying Sangoan and Middle Stone Age series Clark came to same conclusion "that these deposits must belong to a single climatic cycle" (Clark, 1954). Earlier (Acheulian) part of cycle has been referred to as early Gamblian (Clark, 1962) or as late Kanjeran (Cole, 1963) since this pluvial stage and culture have been considered co-terminous.

GrN-2438. Radošiná, Czechoslovakia **38,400 +2800**
-2100
36,450 B.C.

Charcoal from fireplace in cave "Čertova pec," at Radošiná (48° 33' N Lat, 17° 35' E Long), district Topoľčany, Slovakia (Bárta, 1959) depth 1.90 to 2.00 m. Location close to the entrance. Culture layer would belong to Szeletian; geological age would be optimum of Würm I-II interstadial. Coll. by J. Bárta; subm. by H. T. Waterbolk. *Comment*: sample was too small to be given more than an acid pretreatment and age may therefore be too young.

GrN-2181. Nietoperzowa, Poland **38,500 ± 1240**
36,550 B.C.

Well-preserved charcoal from cave of Nietoperzowa at Jerzmanowice (50° 10' N Lat, 19° 54' E Long), near Cracow, Poland. Culture layer, originally described by L. Kozłowski (1924) as belonging to Solutrean, is now considered pre-Solutrean (Szeleta-group). Geological age would be final Würm II. Sample was taken in innermost part of cave. Sterile layer of 0.70 m separates Paleolithic culture layer from Neolithic layer. Coll. 1958 and subm. by W. Chmielewski, Archaeol. Mus., Łódź. *Comment*: date is indeed much older than that of Solutrean sample from Laugerie Haute (GrN-1888: 20,890 ± 300, in Groningen IV, p. 167). No significant difference from date of Radošiná GrN-2938: 38,400, above, also belonging to Szeleta-group of paleolithic cultures.

GrN-2376. Grotte du Renne XII **28,300 ± 1700**
26,350 B.C.

In Groningen IV (p. 166) two dates were given for Layers VII and VIII from cave Grotte du Renne (47° 35' 54" N Lat, 3° 58' 30" E Long), Arcy-sur-Cure, Yonne, France. Results were GrN-1717: 30,800 ± 250 and GrN-1742: 33,860 ± 250 respectively. A further sample, of charred bones from Layer XII, labelled "post-moustérien," has now been dated. Coll. and subm. by A. Leroi-Gourhan, Musée de l'Homme, Paris, France. *Comment*: date has to be considered as a terminum post quem, since material was treated as charcoal and alkali soluble fraction (humus fraction) measured.

GrN-2470. Nemšová, Czechoslovakia **28,570 ± 1300**
26,620 B.C.

Charcoal from culture layer in loess deposit at depth of 4.50 to 4.60 m at Nemšová (48° 58' N Lat, 18° 7' E Long), district Trenčín, Slovakia (Bárta, 1961). Layer probably belongs to Gravettian. Geological age would be the W II/W III interstadial. Coll. by J. Bárta; subm. by H. T. Waterbolk. *Comment*: date is considerably older than those for Gravettian of Nitra-Čermaň and Ságvár (see below), but as far as geological correlation is concerned, compares well with fossil soil horizon dates at Stillfried, Austria as GrN-2533: 28,340 ± 200 and is correlated with "Paudorf" warm phase (Fink, 1962).

GrN-2449. Nitra-Čermaň, Czechoslovakia **23,000 ± 330**
21,050 B.C.

Charcoal from fireplace in Gravettian culture layer in loess deposit at depth of 3.00 m at Nitra-Čermaň (48° 17' N Lat, 18° 4' E Long), district Nitra, Slovakia (Bárta, 1960). Geological age would be base of Würm III. Coll. by J. Bárta; subm. by H. T. Waterbolk. *Comment*: see Ságvár below.

Ságvár series, Hungary

Two charcoal samples from loess site of Ságvár (Gábori and Gábori, 1958) (46° 50' N Lat, 17° 45' E Long), S of Balaton Lake (Plattensee), Hungary. There are two culture layers, an upper at depth of 1.2 to 1.5 m, and a lower at depth of 3.3 to 3.6 m below surface, which is 222 m above sealevel. Both belong to the Gravettian. Coll. (1957 or 1958) and subm. by M. Gábori, Budapest Történeti Muz., Budapest.

GrN-1959. Upper culture layer **17,760 ± 150**
15,810 B.C.

GrN-1783. Lower culture layer **18,900 ± 100**
16,950 B.C.

General Comment: both samples contained some rootlets, but these were sorted out and remaining charcoal was treated with concentrated acid and dil. alkali so that dates are considered reliable. They are, however, somewhat younger than GrN-2449 for the Gravettian at Nitra-Čermán above. See also Arka below.

GrN-4038. Arka, Hungary **17,050 ± 350**
15,100 B.C.

Charcoal (?) from fireplace in loess site of Arka-Herzsarét (ca. 48° 30' N Lat, ca. 21° 30' E Long), district Borsod-Abauj-Zemplén, N Hungary (Vértes, 1962), depth 2 m. Culture layer belongs to Eastern Gravettian. Coll. and subm. by L. Vértes. Budapest. *Comment:* practically all organic matter in sample dissolved in alkali and this fraction was measured. True age may thus be higher. Nevertheless, result compares well with dates for Ságvár, above.

Angles sur l'Anglin series, France

In order to check the sample GrN-1913 (Groningen IV, p. 169), yielding a date of 14,160 ± 80 for a Magdalenian III culture layer in the rock shelter Roc aux Sorciers at Angles sur l'Anglin (46° 42' N Lat, 0° 53' E Long), Vienne, France, two more samples were dated from upper Magdalenian culture layers. Coll. and subm. by S. de Saint-Mathurin, 24 Rue Barbet de Jouy, Paris, France and D. A. E. Garrod.

GrN-2912. Angles sur l'Anglin B4 **10,840 ± 120**
8890 B.C.

From Layer B4, possibly belonging to the Magdalenian V.

GrN-2916. Angles sur l'Anglin B2 + B3 **11,265 ± 130**
9315 B.C.

From Layers B2 and B3 belonging to the Magdalenian VI.

General Comment: relative age of samples is unexpected. Difference, however, is not significant. Furthermore identification of Layer B4 as Magdalenian V was not considered certain by excavators. Taken together, dates show expected difference with regard to Magdalenian III date. Both samples were probably only treated with acid and may be too young.

GrN-828. Witów, Poland **10,820 ± 160**
8870 B.C.

Charcoal layer in late-glacial dune, comparable to Usselo-layer (see Groningen II, p. 3), at Witów (52° 20' N Lat, 19° 8' E Long), district Łęczyca, Poland. Layer also contains flint artifacts, forming a hitherto unknown assemblage. Overlying sand dune contains middle Swiderian industry, considered contemporary to Ahrensburgian of N Germany. Coll. by J. Dylik, Łódź; subm. by G. C. Maarleveld, Stichting voor Bodemkartering, Wageningen, Netherlands. *Comment:* it is satisfactory that the Polish layer is of about the same age as Usselo-layer in Netherlands (Groningen II, p. 3). Compare also Witów dates in Copenhagen V, p. 28.

*B. Neolithic and Later***GrN-2660. Tell Halaf, Syria** **7570 ± 35**
5620 B.C.

Charcoal from hearth in trench in Tell Halaf (36° 48' N Lat, 40° 0' E Long), NE Syria. Hearth contains Halafian painted pottery, but it is situated near transition from "Altmonochrom" ware, and could thus represent an early stage in Halafian development. Coll. and subm. by R. Braidwood, Oriental Inst., Chicago.

GrN-2435. Kečovo, Czechoslovakia **6080 ± 75**
4130 B.C.

Charcoal from settlement of Bükk culture in cave of Domica at Kečovo (48° 28' 40" N Lat, 20° 28' 30" E Long), district Rožňava, Slovakia (Bárta, 1957). Coll. by J. Bárta, Archaeol. Inst. of the Slovakian Acad. of Sci. at Nitra, Czechoslovakia; subm. by H. T. Waterbolk. *Comment*: date agrees with dates for Bandkeramik (e.g., Elsloo in Groningen IV, p. 176), later stages of which are considered contemporary with Bükk culture.

GrN-2805. Dar es Soltane, Morocco **5860 ± 70**
3910 B.C.

Shells from cave deposit (Kitchen midden) at Dar es Soltane (ca. 34° N Lat, 7° W Long), near Rabat, Morocco, depth 1.50 m below upper shell bed. Expected age 5000 yr. Coll. 1960 and subm. by G. C. Maarleveld. *Comment*: date is according to expectation.

Gumelnița series, Rumania

Two samples from oldest archeological level of site of Gumelnița (ca. 44° 5' N Lat, 26° 20' E Long), Rumania. It belongs to A₂ stage of Gumelnița culture. Coll. 1960 by V. Dumitrescu; subm. by E. Condurachi, Archeol. Inst. of the Acad. of the People's Republic of Rumania, Bucarest, Rumania.

GrN-3028. Gumelnița 1 **5400 ± 90**
3450 B.C.

Charred grain.

GrN-3025. Gumelnița 2 **5715 ± 70**
3765 B.C.

Charcoal.

General Comment: slight difference in age between the two samples is explained by the nature of the material. Dates agree with that of another site of Gumelnița culture (Vărăști, GrN-1987: 5360 ± 70; Groningen IV, p. 185). According to traditional archaeological views these dates should be more than 1000 yr later.

Wildeshausen series, Germany

Two more samples from Wildeshausen (52° 53' 30" N Lat, 8° 29' 20" E Long) (see Groningen IV, p. 187), Kreis Oldenburg, Germany, have been measured. Coll. by J. Pätzold; subm. by H. T. Waterbolk.

GrN-4058. Wildeshausen, Katenbäker Heide **4040 ± 80**
2090 B.C.

Charcoal from primary grave of barrow on Katenbäker Heide, excavated in 1952 (Pätzold, 1954). Grave contained two beakers ("Zickzackbecher"), a

battle axe, two axes and two flint blades. *Comment:* date agrees with dates from some Dutch graves with beakers of the same type, e.g., Eext (GrN-939: 3885 ± 65) and Witrijt (GrN-381: 3965 ± 150) (Groningen II).

GrN-4066. Wildeshausen, Katenbäker Berg 2 **3130 ± 40**
1180 B.C.

Charcoal from fireplace at base of Barrow 2 on Katenbäker Berg. Fireplace is 2 m from an inhumation grave containing a wrist-protector and four arrow-heads. Grave and fireplace are thought to be contemporary. *Comment:* date does not agree with expectation; fireplace is apparently younger than grave.

City Farm series, Great Britain

Two samples from Bronze Age site at City Farm (51° 47' N Lat, 1° 26' W Long), Eynsham, Oxford. Coll. 1957 and subm. by H. J. Case.

GrN-1686. City Farm Ia **3440 ± 60**
1490 B.C.

Charcoal from pyre of cremation burial in ring-ditch cemetery with urns which indicate close connection between Britain and Netherlands during Bronze Age.

GrN-1685. City Farm 2 **3460 ± 65**
1510 B.C.

Charcoal from palisade-enclosure adjoining ring-ditch urnfield. Probably somewhat older.

General Comment: no significant difference between the dates. They agree with such dates as GrN-1828: 3420 ± 45 from Dutch barrow Toterfout which produced a Hilversum urn of British affinity (Groningen IV, p. 188).

GrN-1684. Poole I, Great Britain **3210 ± 50**
1260 B.C.

Charcoal from Barrow I, Poole (50° 43' N Lat, 1° 59' W Long), Dorset. Barrow was surrounded by timber circle of the widely-spaced type (Case, 1952). Coll. 1949 and subm. by H. J. Case, Ashmolean Mus., Oxford. *Comment:* date agrees with dates from similar Bronze Age monuments in Netherlands, e.g., from Toterfout-Halve Mijl (Groningen IV, p. 188-9).

GrN-1691. Volders, Austria **2860 ± 50**
910 B.C.

Charcoal from cremation place in urnfield of Volders (47° 20' N Lat, 29° 12' E Long), 13 km E of Innsbruck, Tirol, Austria. Urnfield belongs to "ältere Urnenfelderzeit" and reaches into Hallstatt B₂ period. Cremation place is near youngest part of cemetery, with expected age on archaeological grounds of ca. 800 B.C. Coll. and subm. by A. Kasseroler, Wattens, Tirol, Austria. *Comment:* date agrees with archaeological estimate.

GrN-4067. Einen, Germany **2660 ± 60**
710 B.C.

Charcoal from pyre remains at base of barrow at Einen (52° 47' N Lat, 8° 27' E Long), Gemeinde Goldenstedt, Kreis Vechta, Oldenburg. Barrow has been enlarged twice. Urns, interred after barrow got its final height, belong to Jastorf B stage. Coll. 1958 by J. Pätzold; subm. by H. T. Waterbolk. *Comment:*

sample dates an early stage of cemeteries of Pestrup type. Date is confirmed by date of Jastorf B urns at Pestrup, GrN-3542: 2440 ± 70 (Groningen IV, p. 187).

GrN-2447. Mellrichstadt, Germany **2550 \pm 65**
600 B.C.

Charcoal found associated with bowl of Late Hallstatt period in settlement site of Mellrichstadt (50° 26' N Lat, 10° 19' E Long). Coll. and subm. by J. Wabra, Bad Kissingen, Germany. *Comment*: as expected, date agrees with that from Vogelsburg/Volkach, below.

GrN-2868. Pettange, Luxemburg, alkali soluble fraction **2575 \pm 65**
625 B.C.

GrN-2886. Pettange, Luxemburg, insoluble fraction **2640 \pm 50**
690 B.C.

Mushroom (genus *Fomes* of *Polyporaceae*) found in alluvial sands at depth of 5 m at Pettange, near Mersch (49° 46' N Lat, 6° 7' E Long), Luxemburg. Age on basis of pollen analysis: end of Atlantic. Coll. and subm. by M. Heuertz, Mus. of Nat. History, Luxemburg. *Comment*: a mushroom has the radioactivity of the organic material on which it lives. If this is humus, age obtained will generally be too high. Most *Polyporaceae*, however, are epiphytes of living trees; date will therefore probably be correct.

Vogelsburg/Volkach series, Germany

Two samples from the hillfort of Vogelsburg/Volkach (49° 52' N Lat, 10° 13' E Long), Kreis Gerolzhofen, Germany. Settlement contains remains from *Urnenfelder* culture and from Hallstatt and La Tène periods. In Hallstatt D stage mud-bricks occur of same type as those on the well-known Heuneburg (6th century B.C. on basis of Greek imports). Coll. by Chr. Peschek, Landesamt für Denkmalpflege, Würzburg, Germany; subm. by J. Wabra, Bad Kissingen, Germany.

GrN-2367. Vogelsburg/Volkach I **2410 \pm 90**
460 B.C.

Charcoal from Early La Tène-bowl.

GrN-2363. Vogelsburg/Volkach II **2540 \pm 60**
590 B.C.

Charcoal from Hallstatt D-bowl.

General Comment: dates are in excellent agreement with archeological dating of end of Hallstatt period.

GrN-2148. Dürnberg 1, Austria **2180 \pm 40**
230 B.C.

GrN-2184. Dürnberg 2, Austria **2210 \pm 65**
260 B.C.

Two different samples from flakes of coniferous wood, used as lamps in prehistoric salt mines at Dürnberg near Hallein (47° 40' N Lat, 13° 4' E Long), Austria. Expected age was 900 to 500 B.C. Coll. 1960 and subm. by F. Morton, The Museum, Hallstatt. *Comment*: age appears to be somewhat younger than expected. Prehistoric mining, however, continued for many centuries.

Denekamp series, Netherlands

Four more samples from "es" field Klokkenberg at Denekamp (52° 22' 30" N Lat, 2° 7' 30" E Long) (see Groningen IV, p. 194). Coll. 1961 and 1962 and subm. by T. van der Hammen, Univ. of Leiden, Netherlands.

GrN-2865. Denekamp—Klok 5 **1940 ± 50**
A.D. 10

Charcoal from fireplace on old surface. Expected age between those of samples Klok 3 and 2b (1795 ± 50, GrN-2812 and 4405 ± 55, GrN-2814).

GrN-4090. Denekamp—Klok 7a **2470 ± 80**
520 B.C.

Charcoal from humic layer with Iron Age potsherds in valley sediments below "es" Layers II and III. Depth of sample 2.10 m. Expected age: 2000 to 3500 yr.

GrN-4091. Denekamp—Klok 8 **2560 ± 80**
610 B.C.

Wood from valley sediments below "es" Layers II and III. Depth of sample 2.60 m. Expected age 3000 to 5000 yr.

GrN-4092. Denekamp—Klok 9 **4930 ± 120**
2980 B.C.

Charcoal from sunken fireplace below primary "es" layer. Depth ca. 1.50 m. Fire-place has been correlated with Neolithic flints and potsherds.

General Comment: dates fit in general picture obtained from previous measurements. Apparently there was much prehistoric charcoal on the site before the "es" formation started.

GrN-3140. Sprakeler Dose, Germany **1870 ± 50**
A.D. 80

Wood from trackway (*Bohlenweg*) in raised bog Sprakeler Dose (52° 42' N Lat, 7° 16' E Long), between Sprakel and Tinnen, N of town of Meppen, Germany (Hayen, 1957). Expected age between 200 B.C. and A.D. 200. Coll. and subm. by H. Hayen, Oldenburg. *Comment:* date is according to expectation.

GrN-2121. Utrecht, Netherlands **1160 ± 45**
A.D. 790

Wood from early vessel found at Utrecht (52° 5' N Lat, 5° 8' E Long), Netherlands. Possibility existed that boat might date from Roman period. Coll. and subm. by J. Cayens-de Groot, Centraal Mus., Utrecht, Netherlands. *Comment:* boat appears to date from Carolingian period.

GrN-2086. Cefalu, Italy **700 ± 65**
A.D. 1250

Chips of wood from old building E of Cefalù, Sicily, Italy (38° 4' N Lat, 14° 2' E Long). Expected age 3000 to 800 yr. Subm. by E. Medi, Euratom, Bruxelles.

Niah series, Sarawak

Two samples measured to establish date horizon of late Neolithic at Great Cave of Niah (3° 48' N Lat, 113° 47' E Long), Sarawak. Paleolithic levels

from cave have been dated before (Groningen III). Coll. and subm. by T. Harrison, Sarawak Mus., Kuching, Sarawak.

GrN-1905. Niah W2 **2700 ± 70**
750 B.C.

Charcoal in immediate subsurface layer of main frequentation deposit at Trench W/2 in cave mouth.

GrN-1907. Niah coffin **2695 ± 65**
745 B.C.

Wood from coffin made of hollowed tree trunk in an "extended burial," regarded as latest Stone-Age type. *Comment*: pretreated with acid and alkali. *General Comment*: whole main deposit in cave is pre-Christian and late burials correspond to top levels of frequentation farther out in cave mouth.

GrN-2341. Graniteside, Southern Rhodesia **680 ± 60**
A.D. 1270

Charcoal from inside of pots found in Iron Age cemetery at Graniteside, 4 km S of Salisbury (17° 50' S Lat, 31° 5' E Long), Southern Rhodesia. Several shaft graves with skeletal remains were excavated here in 1958 to 1959 by Queen Victoria Mus., Salisbury. Burials were rich in pottery of more primitive type than that of modern Bantu. Beads, iron objects (bangles), and some small stone artifacts (Wilton) were recovered. Trevor-Jones believes skeletons to be of early type, comparable to those from Mapungubwe on Limpopo River. Subm. 1959 by Mrs. E. Goodall. *Comment*: same age was obtained in Yale on another sample from the site, Y-722: 670 ± 100 (Yale V).

GrN-2222. Hong Kong, China **235 ± 55**
A.D. 1715

Wood coll. at depth of 1.5 m from a cutting at base of a mantle-rock (regolith), derived mainly from soil creep, at Ma Koh Tsui (22° 20' N Lat, 113° 55' E Long), Hong Kong. Site is archaeologically dated at ca. 2000 yr old. Traditionally, area has been burnt-over by Chinese farmers, and recent down-washing of C from charred vegetation is sometimes present. Coll. and subm. by S. G. Davis, Univ. of Hong Kong. *Comment*: dated material is obviously recent.

II. NEW WORLD ARCHAEOLOGY

A. Oceania

Hawaii series

From four archaeological sites on Hawaiian islands several samples were dated in order to check validity of local chronology, based on fishhook types (Emory, 1959), and to obtain further absolute dates for settlement history of these islands. Coll. and subm. by K. P. Emory, Bernice P. Bishop Mus., Honolulu, Hawaii.

GrN-2225. Hawaii H 1 **1660 ± 60**
A.D. 290

Charcoal from sand dune Site H 1 at South Point (18° 54' 30" N Lat, 155° 41' W Long), Kau district, Island of Hawaii. Depth of sample 52½ to 61½ in. Expected age A.D. 750 to A.D. 950 on basis of a C¹⁴ date of Site H 8.

with which Site H 1 is correlated through fishhook types. Coll. 1953. *Comment*: date is unexpectedly high.

GrN-2062. Hawaii H 1 - E 5 **460 ± 40**
A.D. 1490

Charcoal from same site. Coll. 1953 in the middle of a rich cultural layer, Square E 5. Depth 41 in.

GrN-2237. Hawaii H 1 - H 3 **490 ± 60**
A.D. 1460

Charcoal from same site, Square H 3. Coll. 1953. Depth 48 in.

GrN-2061. Hawaii H 2 **recent**

Charcoal from skelter-cave Site H 2 at South Point (18° 55' 20" N Lat, 155° 40' 40" W Long), Kau district, Island of Hawaii. Square S 9. Depth 33 to 38 in. Coll. 1955. Expected age ca. A.D. 1500, through archaeological correlation with Site H 8. *Comment*: from same square, but below present sample (depth 48 in.) a charcoal sample was dated at Michigan (M-478: 200 ± 200, Michigan II). Date was considered too recent, since historical events connected with site can be dated at ca. 1780 and first occupation should be earlier.

GrN-2149. Hawaii H 8 - G 7 **350 ± 40**
A.D. 1600

GrN-2901. Hawaii H 8 - F 5 **350 ± 60**
A.D. 1600

Charcoal from Squares G 7 and F 5 in cave shelter H 8, South Point (18° 57' N Lat, 155° 42' W Long), Kau district, Island of Hawaii. Depth 34 in. and 17 to 21 in., respectively. Coll. 1958. *Comment*: two other samples of cave dated at Michigan: M-666: 1000 ± 200, at depth of 25 to 27 in., and M-863B: 730 ± 200, at 17 to 21 in. (Michigan IV). Our second sample was intended to check discrepancy with Michigan dates. Culturally, our dates seem too young.

GrN-2835. Hawaii H 8 (canoe) **180 ± 40**
A.D. 1770

Part of wooden canoe found (1956) on surface at H 8. Dated as a further check for contamination in cave.

GrN-2293. Hawaii K 3 **580 ± 50**
A.D. 1370

Charcoal from Site K 3, Nualolo-kai (22° 9' 30" N Lat, 159° 42' W Long), Napali district, Island of Knuai. Square D 7. Depth 88 to 98 in. Expected age earlier than A.D. 1400. Coll. 1959. *Comment*: from Square G 10, 72 to 88 in. depth, a Michigan date of 570 ± 150 is available (M-906, Michigan V).

General Comment: no explanation can yet be given for differences between dates obtained for same site, nor for differences between C¹⁴ dates and archaeological estimations.

Society Islands series, French Oceania

Two samples from Society Islands, French Oceania. Coll. in 1960 and subm. by K. P. Emory.

GrN-2902. Matira Point **740 ± 60**
A.D. 1210

Charcoal from cultural deposit at Matira Point (16° 32' 50" S Lat, 151° 44' 20" W Long), Borabora. Depth 71 cm. Expected age 300 to 1000 B.P.

GrN-2960. Ana Paia Shelter **590 ± 55**
A.D. 1360

Charcoal from cultural deposit in rock shelter Ana Paia (17° 35' S Lat, 149° 50' W Long), Maatea district, Moorea. Depth 90 to 105 cm. Expected age 300 to 1000 B.P.

General Comment: dates fall within expected range.

B. America

Little Colorado River Valley series, Arizona, U.S.A.

Series of samples coll. during excavations of Southwest Archaeological Expedition by P. S. Martin and J. B. Rinaldo between 1958 and 1961. Sites sampled represent almost the whole sequence of habitation in the area from ca. 2000 B.C. to A.D. 1400 (Martin and Rinaldo, 1960a, 1960b; Martin and others, 1961, 1962). Subm. by P. S. Martin, Chicago Nat. History Mus., Chicago.

GrN-1614. Laguna Salada site **3520 ± 60**
1570 B.C.

Charcoal from pre-pottery open camp site on beach of a now dry lake (34° 20' N Lat, 109° 40' W Long) excavated in 1958. Surface sites represent earliest occupation in area and have produced quantities of stone tools, bifacially worked scrapers, flake knives, and characteristic projectile points, the last with affinities to the Desert Culture. No building activity found (Martin and Rinaldo, 1960a).

GrN-2801. Tumbleweed Canyon site **1725 ± 50**
A.D. 225

Charcoal from beam in one of three shallow circular pithouses in late pre-pottery settlement at Tumbleweed Canyon (34° 20' N Lat, 109° 25' W Long) excavated in 1960. Artifacts similar to earlier sites (above) except for occurrence of a pestle and (preferably notched) projectile points. Pollen analysis revealed corn pollen (Martin and others, 1962).

GrN-1689. Vernon Site 30, House A **1200 ± 55**
A.D. 750

GrN-1613. Vernon Site 30, House B **1090 ± 55**
A.D. 860

GrN-1690. Vernon Site 30, House B **1180 ± 50**
A.D. 770

Three samples of charcoal from pithouse village near Vernon (34° 12' N Lat, 109° 42' W Long). Site contained pottery belonging to Group III type in classification of Longacre (Martin and others, 1962). Culture shows strong Mogollon affinities from NW.

GrN-2414. Chilcott site 1 **780 ± 80**
A.D. 1170

Charcoal from trench in Room 3, S wall of pithouse at Chilcott Site 1 (34° 23' N Lat, 109° 42' W Long). Rooms of pithouse are roughly rectangular with masonry walls. Predominant painted pottery is of Snowflake Black-on-White type (Group IV). Stone artifacts and painted pottery are closely allied with those of Mogollon in Pine Lawn Valley, New Mexico (Martin and others, 1962).

GrN-3006. Hooper Ranch, Great Kiva (III) **730 ± 60**
A.D. 1220

GrN-4039. Hooper Ranch, Room 5A **570 ± 65**
A.D. 1380

GrN-4040. Hooper Ranch, Room 2B **865 ± 80**
A.D. 1085

Two charcoal samples from floor and one wood sample from center post (GrN-4040) of rooms in Hooper Ranch Pueblo (34° 10' N Lat, 109° 18' W Long) near Springville. This plaza type pueblo had two habitation layers, each containing ca. 60 rooms and 3 rectangular kivas, similar to contemporary Hopi and Zuni ones. Most abundant type of decorated pottery was Tularosa Black-on-White. *Comment:* on typological evidence Martin considers Hooper Ranch Pueblo to be about a century later than Mineral Creek Pueblo; dates confirm. Sample from Room 2B (GrN-4040) is from lower habitation layer; that from Room 5A from upper.

GrN-4111. Carter Ranch, Room 15, floor 1 **990 ± 60**
A.D. 960

GrN-4112. Carter Ranch, Room 15, floor 2 **830 ± 70**
A.D. 1120

GrN-4113. Carter Ranch, Room 10 **840 ± 70**
A.D. 1110

Wood (GrN-4111) and charcoal (GrN-4112) from roof beams of two successive occupation layers of Room 15 and charcoal from floor of Room 10 of Carter Ranch site (34° 31' N Lat, 109° 56' W Long) near Snowflake. *Comment:* no information about archaeological finds or relation to other sites available to authors.

GrN-4007. Rim Valley Pueblo **880 ± 50**
A.D. 1070

Charcoal from roof beam of Room J of small Rim Valley Pueblo village (34° 10' N Lat, 109° 18' W Long) near Springerville, consisting of ca. 25 rooms, one possibly a kiva. Pottery mainly of Reserve Black-on-White, Snowflake Black-on-White, and Tularosa Black-on-White types.

GrN-2417. Mineral Creek, Great Kiva **1220 ± 55**
A.D. 730

GrN-4008. Mineral Creek, Room 2 **1000 ± 50**
A.D. 950

Two charcoal samples from Mineral Creek Pueblo (34° 15' N Lat, 109° 39' W Long) near Vernon, consisting of several adjoining rectangular rooms and separate large round kiva. Snowflake Black-on-White was most popular

painted pottery. *Comment*: Martin considers A.D. 730 (GrN-2417) too early; believes site was not occupied much before ca. A.D. 1000.

GrN-1997. Table Rock Pueblo **615 ± 55**
A.D. 1335

Wood from Table Rock Pueblo (34° 30' N Lat, 109° 20' W Long), St. Johns, coll. 1958. This pueblo, consisting of ca. 60 rooms (some of two stories) and two kivas, is youngest in series and dates from shortly before area was abandoned by pueblo-builders. Pottery is similar to that of upper occupation layer of Hooper Ranch Pueblo (Martin and Rinaldo, 1960b). *Comment*: date (A.D. 1331) from tree ring analysis made by T. Smiley, Tree Ring Lab., Univ. of Arizona, Tucson, agrees with C¹⁴ date.

Bátehatón series, Mexico

Three charcoal samples from cremation urns in caves at Bátehatón (16° 20' N Lat, 90° 50' W Long), Rio Jataté, Chiapas, Mexico (central Maya region). Since Mayas did not burn their dead, age of cremations should be either early Olmeca (2000 to 500 B.C.) or Toltec (from 1000 A.D.). Alt 1000 m. Coll. and subm. by W. Cordan, Escuela Seler, Las Casas (Chiapas), Mexico.

GrN-1637. Bátehatón Cave 10^I **330 ± 60**
A.D. 1620

GrN-1638. Bátehatón Cave 7^{II} **280 ± 55**
A.D. 1670

GrN-790. Bátehatón Cave 7^{III} **410 ± 70**
A.D. 1540

General Comment: dates prove a very recent age of urn burials.

Chiapa de Corzo series, Mexico

Series of samples from Chiapa de Corzo (16° 42' N Lat, 93° 01' W Long), near Tuxtla Gutierrez, state of Chiapas, Mexico. Subm. by T. S. Ferguson, New World Archaeol. Found., Orinda, California.

GrN-1056. Chiapa de Corzo 1 **2370 ± 60**
420 B.C.

Charred wood from Pit 24, Level 2, an ancient refuse dump containing restorable ceramic vessels, ashes, and river snail shells, located 1.2 m below base of Mound 1 substructures. Ceramics pertain to Early Pre-Classic. Coll. 1956 by G. W. Lowe.

GrN-1512. Chiapa de Corzo 3 **3010 ± 50**
1060 B.C.

Two charcoal samples from Pit 38, Level 2, resting on sterile sand at base of cultural deposit representing a mixture of earliest and second earliest phases of Early Pre-Classic. Coll. 1956 by G. W. Lowe. *Comment*: another portion of this specimen was dated at Lamont as 2630 ± 150 B.P. (L-427).

GrN-774. Chiapa de Corzo 5 **3010 ± 150**
1060 B.C.

Charcoal from Pit 50 in deposit of burnt earth, ashes and charcoal at 3.50 m level (anciently filled-in wash). Associated pottery is of earliest cultural period identified in central Chiapas. Coll. 1956 by B. Warren.

GrN-1524. Chiapa de Corzo 6 **2510 ± 45**
560 B.C.

Bits of charcoal from earthen matrix underlying Burial 15, located beneath Mound 1 substructure and placed by its ceramic offering at beginning of Mesoamerican Late Pre-Classic (Chicanel). Coll. 1956 by G. W. Lowe.

GrN-1525. Chiapa de Corzo 7 **2170 ± 50**
220 B.C.

Portion of a burnt pole extending from SE corner of Pit 32B back underneath outer stone walls of Mound 1. Depth 1.10 m directly below SW corner of Wall C in Mound 1. Charcoal and Early Pre-Classic sherds associated with a refuse-laden black soil layer underlying outer Mound 1 constructions. Coll. 1956 by B. Warren. *Comment:* sample from same soil level as GrN-1056, above.

GrN-1589. Chiapa de Corzo 8 **1920 ± 45**
A.D. 30

Charcoal from burnt roof beams lying on floor of buried Structure C, Mound 5. Associated ceramic offering is Proto-Classic. Coll. 1957 by J. Handler.

Santa Rosa series, Mexico

Two samples from Santa Rosa site (16° 04' N Lat, 92° 28' W Long), state of Chiapas, Mexico. Subm. by G. W. Lowe, New World Archeol. Found., Orinda, California.

GrN-1916. Santa Rosa, F10 **1845 ± 50**
A.D. 105

Portion of carbonized post *in situ* in buried floor at 4.10 m depth in Mound B. Associated pottery in mound fill suggests Late Pre-Classic or Proto-Classic period. Coll. 1958 by A. Delgado.

GrN-1932. Santa Rosa, F11 **1990 ± 65**
40 B.C.

Charcoal from ashy layer covering floor of buried platform structure in Mound F. Pottery from fill suggests Late Pre-Classic period. Coll. 1958 by D. Brockington.

General Comment: samples may have been interchanged during chemical pre-treatment in lab., but as there is no significant difference in ages this seems relatively unimportant. Both figures compare well with GrN-1589 which dates Proto-Classic at Chiapa de Corzo (see above).

GrN-2301. Laguna Zope, Mexico **2200 ± 70**
250 B.C.

Charcoal from Laguna Zope (16° 25' N Lat, 95° 62' W Long), E of Juchitan, state of Oaxaca, Mexico, at depth of 5 m in soil beneath mound. Belongs to Pre-Classic or Formative period. Coll. 1958 by A. Delgado; subm. by T. S. Ferguson.

GrN-1906. Kaminaljuyu, Guatemala **1600 ± 50**
A.D. 350

Charcoal from Kaminaljuyu on outskirts of Guatemala City (14° 37' N Lat, 90° 32' W Long), Guatemala. From earliest level of mound structure F'. Coll. 1958 by G. Espinosa for Guatemala Inst. of Anthropol. and History; subm. by T. S. Ferguson.

GrN-2200. Venado Beach, Panama **1125 ± 65**
A.D. 825

Charcoal from contents of a burial urn at Venado Beach (8° 55' N Lat, 79° 35' W Long), Canal Zone, Panama. Site occupied during first stages of Coclé-style Polychrome pottery, and of metal casting. Yale date from charred material in another burial urn (Y-125, 1750 B.P.) believed too early in view of Peruvian traits in Panama and C¹⁴ dates from Peru.

GrN-846. Onverdacht, Suriname **2290 ± 50**
340 B.C.

Charcoal coll. at depth of 50 to 60 cm, together with potsherds and stone objects in former Indian settlement at Onverdacht (5° 37' N Lat, 55° 10' W Long), Suriname. Typologically, pottery resembles that found along Koriobo River in NW British Guiana (Meggers and Evans, 1955); estimated age A.D. 1500. Submitter's number: B-2218. Coll. 1958 and subm. by D. C. Geijskes, Mus. of Suriname, Paramaribo, Suriname. *Comment*: date is older than expected and needs further confirmation.

GrN-1899. Commetewane River, Suriname **1310 ± 45**
A.D. 640

Charcoal, associated with potsherds and stone implements, found 1956 in former Indian settlement near Commetewane River (5° 47' N Lat, 54° 55' W Long), Suriname (Geijskes, 1961). Pottery is slightly more advanced than that from Onverdacht above. Submitter's number C-2358. Coll. and subm. by D. C. Geijskes. *Comment*: large age-difference between GrN-846 above and GrN-1899 was unexpected. Sample was thoroughly pretreated with acid and alkali.

Hertenrits series, Suriname

Three samples from artificial clay mound ("terp"), the Hertenrits (5° 54' N Lat, 56° 40' W Long), N of Wageningen, district Nickerie, Suriname. Mound was supposedly built in pre-Columbian time. Its height is more than 3 m. Samples would represent a relative chronological sequence. Coll. 1957 and subm. by D. C. Geijskes.

GrN-1898. Hertenrits 0397 **1130 ± 45**
A.D. 820

Peaty material with charcoal or charred plant remains at depth of 0.60 m. Associated with potsherds.

GrN-1897. Hertenrits 0638 **1265 ± 60**
A.D. 685

Pieces of wood, associated with potsherds, coll. in third trench, at depth of 2.50 m.

GrN-845. Hertenrits 0689 **1045 ± 60**
A.D. 905

Peat from seventh trench at depth of 3.20 m. Above and below the peat layer was gray clay with potsherds and pieces of wood.
General Comment: no significant difference in age between the three samples.

GrN-2174. Coeroeni-Island, Suriname **785 ± 50**
A.D. 1165

Charcoal and charred palm seeds from former Indian settlement on Coeroeni Island (3° 22.4' N Lat, 57° 17.0' W Long), Upper Corantine, Suriname. Depth 0.30 to 0.40 m. Expected age A.D. 1500. Coll. 1959 and subm. by D. C. Geijskes. *Comment*: date older than inferred from quality of pottery and from fact that site is still overgrown by bamboo.

GrN-2173. Blaugron, Suriname **520 ± 50**
A.D. 1430

Charred palm seeds from former Indian settlement at Blaugron (5° 50.6' N Lat, 55° 8.2' W Long), near Paramaribo, Suriname. Depth 0.40 to 0.50 m. Expected age A.D. 1000. Coll. 1960 and subm. by D. C. Geijskes.

GrN-2321. Morico Creek, Suriname **455 ± 65**
A.D. 1495

Charcoal from former Indian settlement at Morico Creek (5° 45' 30" N Lat, 54° 45' 40" W Long), district Commewijne, Suriname. Depth 0.30 to 0.60 m. Coll. 1961 and subm. by D. C. Geijskes. Expected age A.D. 1000. *Comment*: although the above two dates are younger than expected, they seem acceptable.

Tafi del Valle series, Argentine

Four samples from prehistoric mound of Tafi del Valle (26° 58' 5" S Lat, 65° 54' 8" W Long), province of Tucuman, Argentine. Expected age 1800 to 1900 yr (on basis of C¹⁴ measurements from the Condorhuasi and Cienaga cultures, Gonzalez, 1960). Coll. 1960 and subm. by A. R. Gonzalez, Anthropol. Inst., Trejo 322, Córdoba, Argentine.

GrN-2948. Tafi del Valle 1 **1950 ± 60**
A.D. 1

Charred bones from depth of 1.20 m.

GrN-2946. Tafi del Valle 2 **1950 ± 60**
A.D. 1

Charred bones from depth 0.70 to 1.70 m.

GrN-3031. Tafi del Valle 4 **1930 ± 60**
A.D. 20

Charred bones from depth 2.00 m.

GrN-2967. Tafi del Valle 5 **1920 ± 65**
A.D. 30

Charcoal and charred bones from base of mound (depth 2.80 m).

General Comment: Yale measurement for a charcoal sample from depth of 2.20 m is 2296 ± 70 (Y-888).

III. VARIOUS SAMPLES

Sugar Loaf series, Netherlands Antilles

Two coral samples from Sugar Loaf (17° 28' N Lat, 62° 58' W Long), St. Eustatius, Netherlands Antilles. Geological age, on basis of paleontological evidence, is either late-Pliocene or, more probably, late-Pleistocene or sub-

recent. Coll. 1958 by H. Kiel and J. H. Westermann; subm. by J. H. Westermann, Found. for Sci. Research in Surinam and the Netherlands Antilles, the Hague, Netherlands.

GrN-2651. Sugar Loaf 31^B	22,400 ± 100
	20,450 B.C.
GrN-2655. Sugar Loaf 55^A	>46,500

Sample is separated from preceding sample by a stratigraphical thickness of 30 m.

General Comment: date of GrN-2651 is as expected; GrN-2655 seems too old in view of GrN-2656 (see below). However, fossil coral can easily be incorporated in a younger reef.

GrN-2656. White Wall, Netherlands Antilles	32,960 ± 300
	31,010 B.C.

Coral sample from White Wall (17° 28' N Lat, 62° 58' W Long), St. Eustatius, Netherlands Antilles, stratigraphically 20 m below sample Sugar Loaf 55^A. Coll. 1958 by J. Kiel and J. H. Westermann; subm. by J. H. Westermann. *Comment:* date agrees with that of Sugar Loaf 31^B, above; resulting sedimentation rate of about 0.5 cm/yr is considered acceptable.

GrN-2653. Brimstone Hill, Lesser Antilles	44,720 ± 1150
	42,770 B.C.

Coral sample from Brimstone Hill (ca. 17° 20' N Lat, 62° 45' W Long), St. Kitts, Lesser Antilles. No clear stratigraphical correlation with samples of St. Eustatius. Coll. 1958 by H. Kiel and J. H. Westerman; subm. by J. H. Westermann. *Comment:* date is as expected.

Ekeren series, Belgium

Three samples from section of sand with intercalating peat layers at Ekeren, municipality of Stabroek (51° 19' N Lat, 4° 25' E Long), Belgium. From a peaty layer at depth of 1.45 to 1.65 m. Pollen analysis indicates a Bølling age. Coll. and subm. by R. Vanhoorne, Royal Inst. of Nat. Sci., Brussels.

GrN-3049. Ekeren 1 (wood remains)	12,330 ± 120
	10,380 B.C.
GrN-3052. Ekeren 2	12,340 ± 120
	10,390 B.C.
GrN-2458. Ekeren 3	12,460 ± 140
	10,510 B.C.

General Comment: dates agree with supposed Bølling age of the peat.

Marudi series, Brunei

These samples from extensive peat deposit covering ca. 700 square mi at Marudi (ca. 4° 40' N Lat, 114° 05' E Long), in lower Baram River valley, Fourth Division. Preliminary pollen analyses show that peat has formed on mangrove and has been gradually built up by a succession of forest types. At 13 m pollen of *Nipa*, *Rhizophora* and *Sumeratia*, at 8.5 m *Gonystylus* pollen, and from 5 m *Shorea* and *Pandanus* pollen were found. Dates were expected to give information on rate of change of forest types in the area, on growth of

Baram delta and on recent changes of sealevel in area. Coll. and subm. by G. E. Wilford, Geol. Survey Dept., Brunei.

GrN-1960. Marudi 5488	2265 ± 60
Depth 5 m.	315 B.C.
GrN-1962. Marudi 5489	3860 ± 55
Depth 10 m.	1910 B.C.
GrN-1963. Marudi 5490	4280 ± 70
Depth 12 m.	2330 B.C.

Pitldown series

After the demonstration of the Pitldown forgery through the fluorine method by K. P. Oakley in 1950 it was considered worthwhile to obtain C¹⁴ dates from the jawbone and the cranium, which the forger had placed together. Jawbone should be that of a modern orangutan, but age of skull was still uncertain. According to fluorine test it should have been lying in the soil for several centuries. Coll. and subm. by K. P. Oakley, British Mus. (Nat. History), London.

GrN-2204. Pitldown—jawbone	500 ± 100
	A.D. 1450
GrN-2203. Pitldown—skull	620 ± 100
	A.D. 1330

General Comment: the geologically recent age of the jawbone is confirmed by the C¹⁴ date. Ethnological evidence suggests it may be a few centuries old: Dyaks are known to preserve orangutan skulls as fetishes or trophies for many centuries. For further details and comments see de Vries and Oakley (1959).

Correction to Groningen IV, Radiocarbon, vol. 5, p. 184, sample GrN-1546 (Vinga A). First line should read: "Charcoal collected in 1958 by H. T. Waterbolk in the lowermost hori-".

REFERENCES

Date lists:

Copenhagen V	Tauber, 1962
Groningen II	de Vries, Barendsen, and Waterbolk, 1958
Groningen III	de Vries and Waterbolk, 1958
Groningen IV	Vogel and Waterbolk, 1963
Lamont V	Olson and Broecker, 1959
Michigan II	Crane and Griffin, 1958
Michigan IV	Crane and Griffin, 1959
Michigan V	Crane and Griffin, 1960
Yale V	Stuiver, Deevey, and Gralenski, 1960

Bárta, J., 1957, Záchranný výskum v záplavou postihutej jaskyni Domisi: Studiyné zvesti AU SAV, v. 2, p. 29-33. Nitra.

——— 1959, Výskum jaskyne Čertovej pece pri Rodožinej: Studiyné zvesti AU SAV, v. 3, p. 163 ff.

——— 1960, Paleolitické nálezy v. Nitre a na jej okolí: Archeologické rozhledy, v. 12, p. 318 ff.

——— 1961, K problematike paleolitu Bielych Karpát: Slovenská Archeológia, v. 9, p. 9-32. (German summary: Zur Problematik des Paläolithikum der weissen Karpaten).

Case, H. J., 1952, The Excavation of two round barrows at Poole, Dorset: Proc. Prehist. Soc., v. 18, p. 148-159.

- Clark, J. D., 1954, An Early Upper Pleistocene site at the Kalambo Falls on the Northern Rhodesia/Tanganyika border: *South African Archeol. Bull.*, v. 9, p. 51-56.
- 1962, Carbon 14 chronology in Africa south of the Sahara: *in* Mortelmans, J.: *Actes du IVe Cong. Pan-Africain de Préhistoire*, Tervuren, v. 2, p. 303-314.
- Cole, S., 1963, *The prehistory of East Africa*: New York, MacMillan.
- Crane, H. R., and Griffin, J. B., 1958, University of Michigan radiocarbon dates II: *Science*, v. 127, p. 1098-1105.
- 1959, University of Michigan radiocarbon dates IV: *Am. Jour. Sci. Radioc. Supp.*, v. 1, p. 173-198.
- 1960, University of Michigan radiocarbon dates V: *Am. Jour. Sci. Radioc. Supp.*, v. 2, p. 31-48.
- Emory, K. P., 1959, Hawaiian archeology: fishhooks: *Bishop Mus. Special Pub.* no. 47.
- Fink, J., 1962, Studien zur absoluten und relativen Chronologie der Fossilen Böden in Österreich II, Wetzleindorf und Stillfried: *Archeol. Austria*, v. 31, p. 1-18.
- Gábori, M. and Gábori, V., 1958, Der erste paläolithische hausgrundriss in Ungarn: *Acta Archaeol. Acad. Scientiarum Hungaricae*, v. 9, p. 19-34.
- Garrod, D. A. E., 1956, Acheuléo-Jabroudien et "Pré-Aurignacien" de la Grotte du Taboun (Mont Carmel); étude stratigraphique et chronologique: *Quaternaria*, v. 3, p. 39-59.
- Geijskes, D. C., 1961, Archeologische vondsten van de Zandritsen bij de Commetewanekreet (District commewijne) in Suriname: *Ber. van de Rijksdienst voor het Oudheidkundig Bodemonderzoek*, v. 10-11, p. 95-124.
- González, A. R., 1960, Nuevas fechas de la cronología arqueológica argentina obtenidas por el método de radiocarbón (III): *Ciencia e Investigación*, v. 16, p. 142-145.
- Haring, A., Vries, A. E. de, and Vries, H. de, 1958, Radiocarbon dating up to 70,000 years by isotope enrichment: *Science*, v. 128, p. 472-473.
- Hayen, H., 1957, Zur Bautechnik und Typologie der vorgeschichtlicher, frühgeschichtlichen und mittelalterlichen hölzernen Moorwege und Moorstrassen: *Oldenburger Jahrb.*, v. 56, p. 87-189.
- Kasseroler, A., 1959, *Das Urnenfeld von Volders*: Innsbruck.
- Kozłowski, L., 1924, Die ältere Steinzeit in Polen: *Die Eiszeit*, v. B1, p. 112-163.
- Liere, W. J. van, 1960-1961, Observations on the Quaternary of Syria: *Ber. van de Rijksdienst voor het Oudheidkundig Bodemonderzoek*, v. 10-11, p. 7-69.
- Maier, R. A., 1961, Fundchronik für das Jahr 1960: *Bayerische Vorgeschichtsblätter*, v. 26 (2), p. 288-289.
- Martin, P. S., and Rinaldo, J. B., 1960a, Excavations in the Upper Little Colorado drainage, eastern Arizona: *Fieldiana: Anthropology*, v. 51, no. 1.
- 1960b, Table Rock Pueblo, Arizona: *Fieldiana: Anthropology*, v. 51, no. 2.
- Martin, P. S., Rinaldo, J. B., and Longacre, W. A., 1961, Mineral Creek Site and Hooper Ranch Pueblo, eastern Arizona: *Fieldiana: Anthropology*, v. 52, p. 181.
- Martin, P. S., Rinaldo, J. B., Longacre, W. A., Cronin, C., Freeman, L. G., and Schoenwetter, J., 1962, Chapters in the prehistory of eastern Arizona, I: *Fieldiana: Anthropology*, v. 53, p. 244.
- Meggers, B. J., and Evans, C., 1955, Preliminary results of archaeological investigations in British Guiana: *Timehri*, v. 34, p. 5-26.
- Olson, E. A., and Broecker, W. S., 1959, Lamont natural radiocarbon measurements V: *Am. Jour. Sci. Radioc. Supp.*, v. 1, p. 1-28.
- Pätzold, J., 1954, Ein reichhaltiger Grabhügel der Einzelgrabkultur: *Oldenburger Jahrb.*, v. 54, p. 3-26.
- Stuiver, M., Deevey, E. S., and Galenski, L. J., 1960, Yale natural radiocarbon measurements V: *Am. Jour. Sci. Radioc. Supp.*, v. 2, p. 49-61.
- Tauber, Henrik, 1962, Copenhagen radiocarbon dates IV: *Radiocarbon*, v. 4, p. 27-34.
- Vértes, L., 1962, Ausgrabungen der Altsteinzeitlichen Siedlung von Arka 1960-61: *Acta Archeol. Acad. Scientiarum Hungaricae*, v. 14, p. 143-157.
- Vogel, J. C., and Waterbolk, H. T., 1963, Groningen radiocarbon dates IV: *Radiocarbon*, v. 5, p. 163-202.
- Vries, H. de, Barendsen, G. W., and Waterbolk, H. T., 1958, Groningen radiocarbon dates II: *Science*, v. 127, p. 129-137.
- Vries, H. de, and Oakley, K. P., 1959, Radiocarbon dating of the Piltdown skull and jaw: *Nature*, v. 184, p. 224-226.
- Vries, H. de, and Waterbolk, H. T., 1958, Groningen radiocarbon dates III: *Science*, v. 128, p. 1550-1556.
- Waechter, J.d'A., 1951, Excavations at Gorham's Cave, Gibraltar: *Proc. Prehist. Soc.*, v. 17 (1), p. 83-92.
- Zeuner, F. E., 1953, The chronology of the Mousterian at Gorham's Cave, Gibraltar: *Proc. Prehist. Soc.*, v. 19 (2), p. 180-188.