

THE END OF THE 2nd MILLENNIUM BCE AND THE TRANSITION FROM IRON I TO IRON IIA: RADIOCARBON DATES OF TEL REHOV, ISRAEL

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INTRODUCTION

The Iron Age in Israel covers approximately the last two centuries of the 2nd millennium BCE and continues until the Babylonian conquest in 586 BCE. Division of the Iron Age is based on ceramic styles, architecture and associated relations with literary data. Various systems have been proposed. Until the late 1960s many scholars used the following subdivision: 1200–920/900 BCE for Iron Age I and 920/900–586 BCE for Iron Age II (WRIGHT 1961:96–101).¹ Following the excavations at Hazor (YADIN 1961), a new division was proposed by AHARONI and AMIRAN (1958). They suggested a tripartite division of the Iron Age (which they called “Israelite Period”) into three sub-periods: I) 1200–1000; II) 1000–84; III) 840–587. Henceforth, the date 1000 BCE for the transition from Iron I to Iron II was accepted in all major publications.

The term Iron IIA was used by some to include both the 10th and 9th century, such as BEN-TOR (1992:2) and BARKAY (1992:305), as well as Mazar since 2001 (MAZAR and CARMI 2001:1340–1341; COLDSTREAM and MAZAR 2003:40–44). Others confined the Iron IIA period only to the 10th century, mainly referring to the time of the Israelite United Monarchy of David and Solomon (STERN 1992:1529; MAZAR 1990; HERR 1997).

The discovery of a ceramic assemblage similar to Iron IIA in the destruction layer of Jezreel (USSISHKIN and WOODHEAD, 1994), a royal citadel of the Omride Dynasty (9th century, *ca* 885–843 BCE), led to the renewal of an old debate concerning the attribution of pottery and architectural assemblages to either the 10th or the 9th century BCE. FINKELSTEIN (1996) renewed the ideas of CROWFOOT (1940) and to some extent KENYON (1964) – the latter only concerning the pottery – that the cultural horizon attributed

by most scholars to the 10th century should be associated with the Omride Dynasty in the 9th century. He also claimed that the boundary between Iron I and Iron IIA should be lowered by about 80 years, from *ca* 1000 BCE to *ca* 920 BCE. The historical implications are obvious: all the buildings and cultural assemblages related by various scholars to David and Solomon should be attributed to the Omride Dynasty. Thus the “archaeology of the United Monarchy” is allegedly eliminated. The lowering of the Iron Age chronology gave legitimacy to skeptic evaluations of the historicity of the United Monarchy (FINKELSTEIN 1999). This suggestion raised fierce archaeological controversy, in which chronology is at the heart of the debate (MAZAR 1997; BEN-TOR 2000; BEN-TOR and BEN-AMI 1998; FINKELSTEIN 2002).

Radiocarbon dating did not play any role in these archaeological time assessments and divisions of the Iron Age. The need for an independent, high-precision, ¹⁴C chronology in Near Eastern archaeology of the Bronze and Iron Ages was advocated in the 1980s by BRUINS and MOOK (1989). Gradually a growing awareness developed concerning the potential significance of such impartial chronological measurements for the Iron Age dilemma. However, chronological questions within a time resolution of one century are at the limit of single calibrated ¹⁴C dates, due to the wiggles in the calibration curve. Stratified series may have a far better time-resolution potential, but quality control through repeated measurements and inter-laboratory comparison are essential in the high precision and accuracy demands of the historical periods of the Near East (VAN DER PLICHT and BRUINS 2001).

Investigations by MAZAR and CARMI (2001) gave ambiguous results concerning ¹⁴C dates from Iron Age layers at Tel Beth Shean and Tel Rehov. Some dates measured in the Rehovot Radiocarbon Laboratory

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¹ The date 920 or 918 BCE was related to the military campaign by Shoshenq I (biblical Shishak) in the Land of Israel, documented both at Karnak (Egypt) and in the Hebrew Bible.

appear too young by a large margin of a few centuries, too low even for the Low Chronology (such as those from Phase D-3; MAZAR and CARMI 2001:1336; concerning the 18 dates from Locus 2425 see below, p. 91). GILBOA and SHARON (2001) published the results of radiocarbon measurements of charcoal samples from Tel Dor (SHARON 2001), which were accepted by them as evidence to support the Low Chronology, because many of the radiometric dates were up to a century lower than the conventional ceramic chronology. We note that all these dates were measured by the Rehovot Radiocarbon Laboratory. In addition, the Tel Dor samples in the above investigation consist of multi-year charcoal with a possible old wood effect. Hence the age difference of the young radiocarbon dates in comparison with the conventional chronology is even more pronounced! GILBOA and SHARON (2001:1343) succinctly described some principal repercussions of the Low Chronology: (a) “11th century archaeological strata and various material phenomena should be assigned to the 10th, and 10th century ones to the 9th”; (b) This “would by and large ‘rob’ the United Monarchy of material remains compatible with an organized state”. This claim is based on ¹⁴C dates of charcoal samples, measured by only one laboratory.

Quality control of radiocarbon dating is not a minor issue, particularly when high temporal resolution is required. Radiocarbon laboratories are usually aware of the need to evaluate the quality of the dates they produce. “The two questions of reliability and reproducibility of routinely acquired ¹⁴C dates have been and continue to be of interest to both providers and users. One of the most direct means of assessing these properties has been through organized interlaboratory comparisons” (SCOTT et al. 1998:331). Results of the Third International Radiocarbon Intercomparison (TIRI) and the Fourth International Radiocarbon Intercomparison (FIRI) have recently been published (SCOTT, 2003).

A detailed, high-quality series of radiocarbon dates from Tel Rehov, was obtained at the Centre for Isotope Research, University of Groningen (The Netherlands), using two different ¹⁴C laboratories: (1) Conventional measurements of radioactive carbon using Proportional Gas Counting (PGC) and (2) Accelerator Mass Spectrometry (AMS). All samples were pretreated with the acid/alkali/acid (AAA) method (MOOK and WATERBOLK 1985). The purified organic matter of each sample was subsequently converted into CO₂. For AMS dating (VAN DER PLICHT et al. 2000), the CO₂ gas underwent additional treatment to convert it into solid graphite. The consistent series of radiocarbon dates, based on charred short-

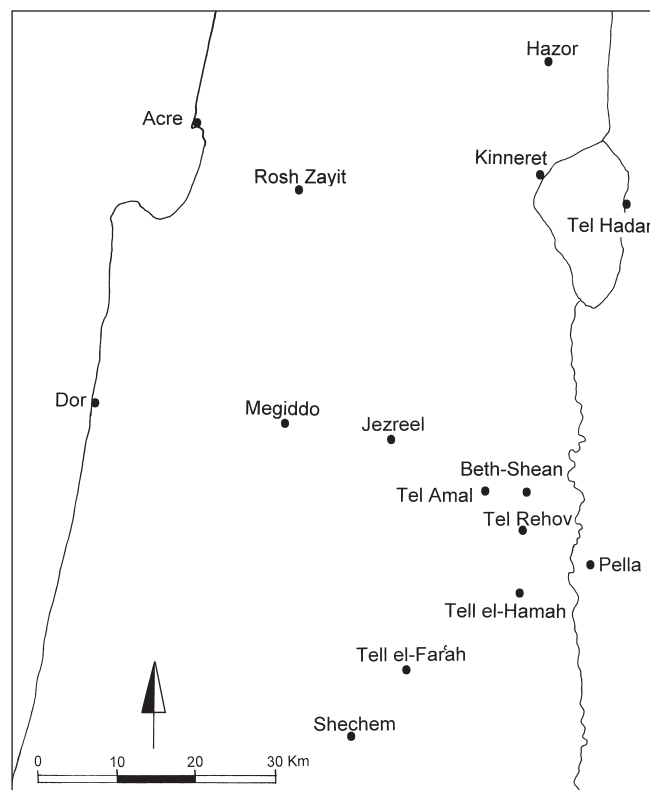


Fig. 1 Location map of Tel Rehov

lived samples, enabled stratigraphic wiggle matching (BRUINS, VAN DER PLICHT and MAZAR 2003a). The results show a sequential time-series that ranges from the 12th to the 9th centuries BCE. The calibrated radiocarbon dating sequence gives independent evidence, based on scientific methods and independent from historical or biblical data, that Iron Age IIA pottery continued to be in use for a rather long period, covering large parts of *both* the 10th and 9th century BCE, thus supporting the time frame suggested by Aharoni and Amiran and accepted by Barkay, Ben Tor and lately by Mazar (references above).

FINKELSTEIN and PIASETZKY (2003a, 2003b) contested our conclusions, trying to place the Groningen radiocarbon dates into the Low Chronology system. We rejected their arguments in a technical reply (BRUINS, VAN DER PLICHT and MAZAR 2003b). In the current article we have the opportunity to present our results in much more detail than was possible in the articles published in Science. Following the arguments by FINKELSTEIN and PIASETZKY (2003a, 2003b), we need to compare the Groningen radiocarbon results in detail with the Rehovot radiocarbon dates. In this article, we focus our attention on the radiocarbon chronology of the Iron I period and the transition to the Iron Age IIA period. The reasons are twofold (1) The SCIEP 2000 Program is directed at the 2nd mil-

Final Stratum	Area D	Area C	Area E	Area F	Area G	Area B	Area A	Period	Age assessment
	–	–	E-0			B-0	A-1a	Late Arab	Undated burials
I	–	–				B-1	A-1b	Early Arab	8–12 th century CE
II	–	–				B-2	A-2	Iron Age IIC	Late 8 th early 7 th (?) century BCE
III	–	–				B-3	A-3a A-3b	Iron Age IIB	Until 732 BCE.
IV	–	C-1a	E-1a	F-1	G-1	B-4*	A-4	Iron Age IIA	Until ca. 830–840 BCE
V	D-1(?)	C-1b	E-1b	2	2	5a* 5b			From ca. 980
VI	D-1(?)–D-2	C-2	E-2	F-3-4	G-3	B-6			
VII	D-3 D-4 D-5	C-3						Iron Age IB	Until 990–980 BCE ca. 1130 (?) BCE
	D-6 D-7							Iron Age IA	12 th century BCE
	D-8 D-9a D-9b							Late Bronze IIB	13 th century BCE
	D-10							Late Bronze I–IIA	15 th –14 th century BCE
	D-11							MB/LBI	16 th century BCE

* Needs further clarification in the future. It is possible that 5a should be correlated with general Stratum IV

Table 1 Stratigraphic table of Tel Rehov, showing the correlation between local phases in the different excavation areas and the general strata numbers

lennium BCE. (2) The amount of radiocarbon dates and required figures, as well as the archaeological context, are too much for detailed treatment in one article. A future paper will deal more extensively with the Iron Age IIA period (MAZAR, BRUINS, PANITZ-COHEN and VAN DER PLICHT in preparation).

RADIOCARBON DATES OF TEL REHOV

Tel Rehov is a large site, covering 10 hectares, situated at an important geographic junction, 28 km south of Lake Kinneret and 5 km south of Beth Shean (Figure 1). Six excavation seasons in the years 1997 to 2003 revealed complex stratigraphic sequences in seven excavation areas, yielding rich material assemblages, mainly from the Iron Age IIA period (MAZAR

1999; MAZAR 2002; MAZAR in press).² The first two series of radiocarbon measurements, consisting altogether of 24 dates from seven loci, were measured during the years 1998–1999 in the ¹⁴C Laboratory of the Weizmann Institute in Rehovot and the AMS Laboratory of the University of Arizona (MAZAR and CARMİ 2001). Another series of more than 30 dates from 14 loci were measured during 2001–2002 at the University of Groningen (BRUINS, VAN DER PLICHT and MAZAR 2003a, 2003b). Both conventional and AMS measurement techniques were used at the latter institution, according to sample size and for quality control. All these dates together constitute the largest group of radiometric measurements from a single Iron Age site in the Levant.

² The excavations at Tel Rehov, directed by A.Mazar, are conducted under the auspices of the Institute of Archaeology of the Hebrew University and sponsored by Mr. John Camp. Our thanks to Mr. Harm-Jan Streurman, Mrs. Anita

T. Aerts-Bijma and Mr. Stef Wijma for carefully preparing and measuring the radiocarbon samples at the Centre for Isotope Research of Groningen University.

The great majority of the organic materials used in the ^{14}C determinations consist of short-lived charred grains and olive pits. Most samples came from the best stratigraphic contexts available in each stratum, as explained in detail below.³ The relative stratigraphy in each of the excavation areas at Tel Rehov is shown in Table 1. Iron Age I layers were excavated so far only in Area D and thus the local phase numbers of this area were retained. The Iron II layers were excavated at several areas of the tell, each area with its own respective stratigraphic phase numbers. An attempt was made to correlate these local stratigraphic phases into a comprehensive overall strata framework (marked in Roman numerals in the 1st column of Table 1). This correlation may become further refined in future excavations.

THE IRON AGE I

The excavations at Tel Rehov exhibited successive layers of the Iron Age I period in Area D (Figure 2 and 3), a 5 m wide step trench on the western slope of the lower city (MAZAR 1999:9–16). This trench yielded 11 stratigraphic phases (D11–D1), as summarised in Table 1. The lower four phases are characterised by Late Bronze Age pottery. The five following phases yielded Iron Age I pottery while the uppermost two phases yielded Iron IIA pottery.⁴ Area D is attached to Area C, and thus the last two phases can be correlated with the large exposures of Iron IIA strata in Area C.

Phase D-6

Phases D-7 and D-6 yielded pottery similar to the ceramic horizon of nearby Tel Beth Shean Level VI (University of Pennsylvania excavations) or Strata S-4 and S-3 (the Hebrew University excavations; MAZAR 1993; 2003a: 324, 333–337). These levels at Beth Shean can thus be securely dated to the time of the 20th Dynasty, most probably related to the reigns of Pharaohs Ramesses III to VI. Phase D-7 exhibited several walls, floors and two foundation deposits with lamp and bowls, typical for the period under consideration, yet no charred organic remains were found. The later Phase D-6, which yielded charred seeds for radiocarbon dating, displayed several floor surfaces but very little architecture. The small amount of pottery from Phase D-6 included also two

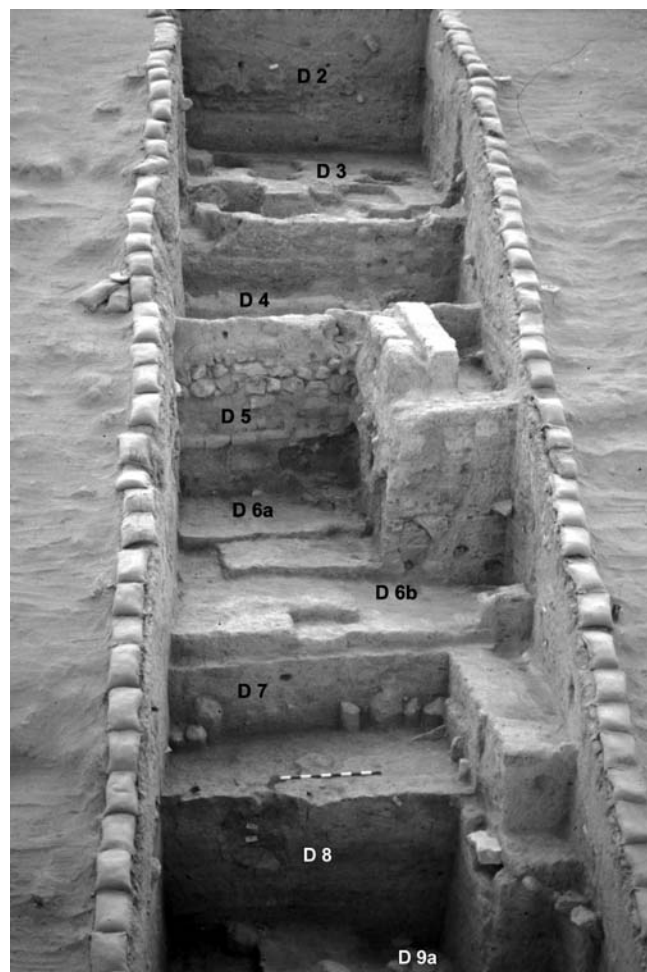


Fig. 2 Area D of Tel Rehov; the Late Bronze Age is exhibited in the lower part of the section, while the Iron Age phases 6, 5, 4, 3 and 2 (discussed in the text) appear in the upper part

sherds of imported Mycenaean IIIC pottery, just like at Tel Beth Shean in the correlated levels.

Charred olive pits found in Locus 2874 and Locus 2836 of Phase D-6 were dated in Groningen by both Conventional (Proportional Gas Counting – PGC) and AMS techniques (laboratory codes GrN and GrA, respectively). Locus 2874 constitutes a plastered basin sunk from a floor in Square P4, sealed by brick debris. The other Locus 2836 from Square N4 is a layer of occupation debris that includes organic deposits and ash patches at levels 83.39–82.86. The Groningen AMS and PGC dates of Locus 2874 were 2935 ± 45 BP (GrA-19034) and 2880 ± 30 BP (GrN-26120), respectively (Table 2). The results are well

³ FINKELSTEIN and PIASEZTKY (2003a, 2003b) criticize some of our contexts as unreliable. We reject this criticism, as we explain the nature of each context in some detail in the following paragraphs.

⁴ We use here the term Iron IA for the period of the Egyptian 20th Dynasty, following the terminology in STERN (ed.) 1993. Some Israeli scholars include this period in the Late Bronze Age (USSISHKIN 1985; GILBOA and SHARON 2003).

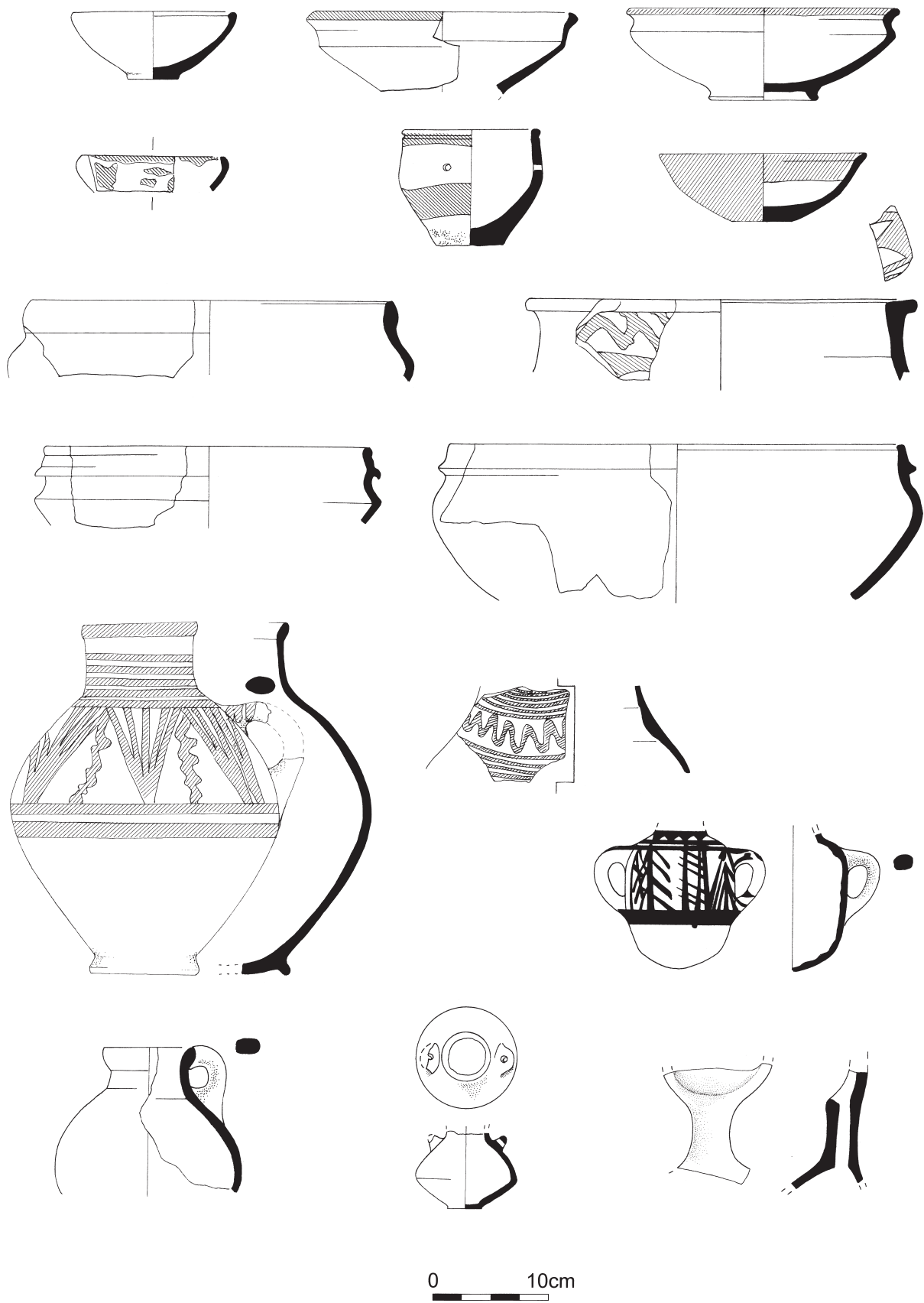


Fig. 3a Selected pottery forms from Phase D-4

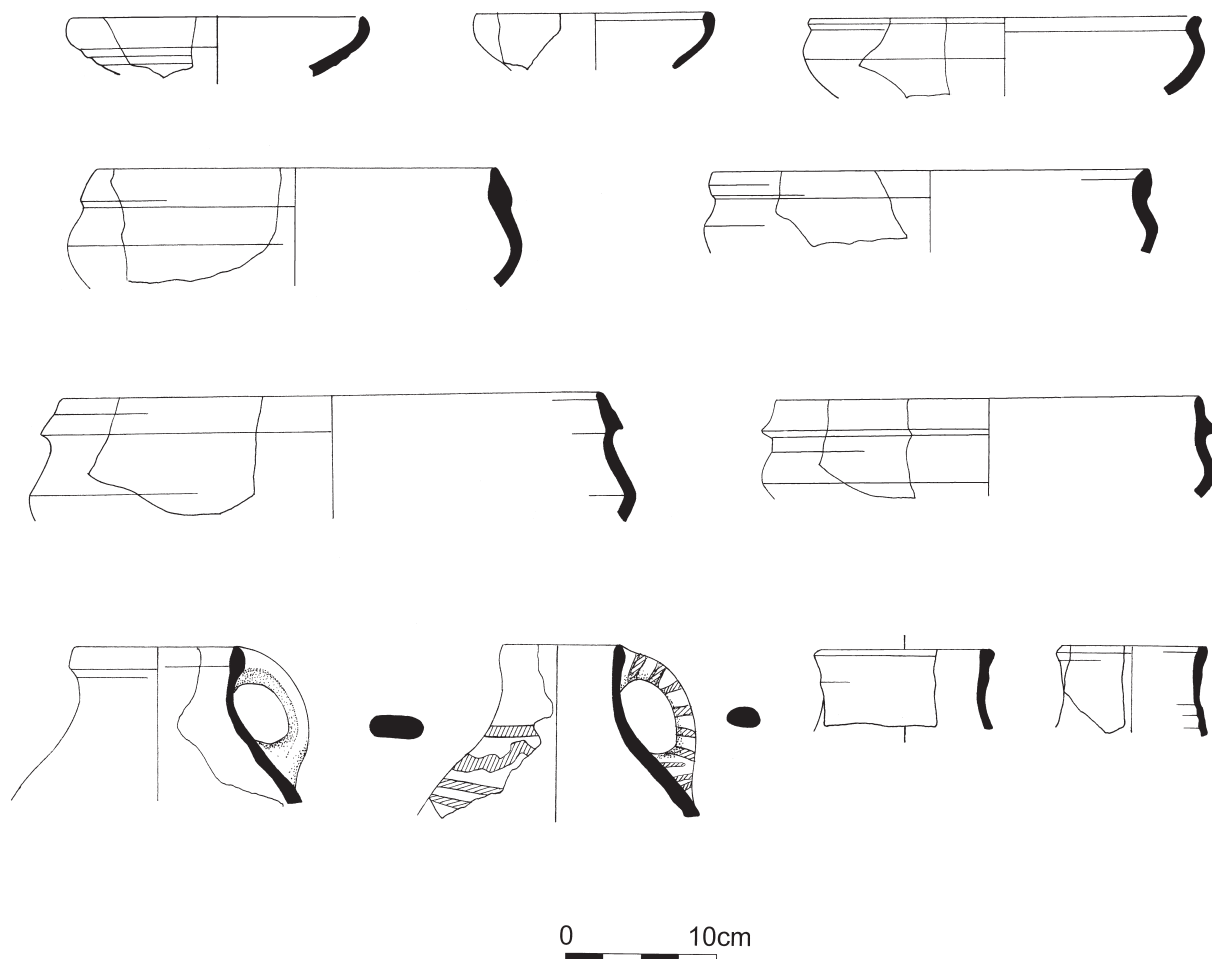


Fig. 3b Selected pottery forms from Phase D-3

within 2σ from each other and therefore acceptable. The weighted average has a smaller standard deviation 2897 ± 25 BP. The Groningen dates of Locus 2836 were 2950 ± 50 BP (GrA-18826) and 2920 ± 30 BP (GrN-26118), respectively by AMS and PGC. The two results are even closer, within 1σ from each other. The average date is 2928 ± 26 yr BP.

The calibration curve remains at a rather similar level, albeit with many wiggles, for much of the 13th to 11th century BCE (radiocarbon year period of about 3020–2880 BP). Therefore, the calibration of individual loci will inevitably result in wide age ranges. The undifferentiated 1σ calibrated range for the average date of Locus 2874 is 1125–1020 BCE, while the more precise average result of Locus 2836 results in a 1σ calibrated range of 1209–1050 BCE. Looking again at the four individual dating results for Phase D-6 in conventional BP years, three are almost similar (2920 ± 30 , 2950 ± 50 , 2935 ± 45), while one is somewhat younger (2880 ± 30). The average of Locus 2836, therefore, may reflect Phase D-6 more accurately. Its full calibrated range is graphi-

cally shown in Figure 4. Considering the stratigraphic sequence and the ceramic assemblage, the period 1130–1090 BCE within the calibrated result seems most likely for this stratum.

A sample of charred olive pits found on a floor surface in the same phase (Locus 1876) was dated at the Weizmann Institute in Rehovot (RT-3119; MAZAR and CARMİ 2001:1336). The resulting date of 2685 ± 40 BP is 243 years younger than the Groningen average. Its calibrated date in the 9th century BCE is much too young by all standards as already mentioned (MAZAR and CARMİ 2001:1336).

Phases D-5 and D-4.

Phases D-5 and D-4 constitute two distinct architectural periods, characterised by a north-south oriented street flanked by buildings on both sides. The occupation debris of D5, sealed by that of D-4, has hardly been excavated. However, living surfaces of Phase D4 were excavated in the street as well as in a courtyard paved with cobble stones during its initial phase. The original floor surfaces in both cases were

Phase	Locus	Basket	Charred Organic Material	Lab No	¹⁴ C Date (BP)	δ ¹³ C (‰)	¹⁴ C Date BP or Average used in calibration	1σ Calibrated Date 1998 Curve OxCal v3.9 (year BCE)	2σ Calibrated Date 1998 Curve OxCal v3.9 (year BCE)
D-2 Iron IIA	1802	18119	Olive pits	GrN-26112	2805 ± 15	-22.46	same	997-989 (8.5%) 974-954 (25.9%) 944-919 (33.8%)	999-913 (91.8%) 912-905 (3.6%)
D-3 Iron IB-IIA transition	1858	28395	Olive pits	<i>RT-3120</i>	<i>2670 ± 40</i>	<i>-20.80</i>	<i>same</i>	<i>892-880 (11.4%) 836-799 (56.8%)</i>	<i>900-795 (95.4%)</i>
D-3 Iron IB-IIA transition	2862	28493	Olive pits	GrA-19033 <i>GrN-26119</i>	2835 ± 45 <i>2720 ± 30</i>	-23.03 <i>-22.33</i>	2835 ± 45	1046-920 (68.2%)	1128-896 (93.5%) 877-857 (1.9%)
D-3 Iron IB-IIA transition	4815	48105	Olive pits	GrA-16757	2820 ± 50	-22.51	same	1042-1031 (3.8%) 1022-901 (64.4%)	1126-891 (87.0%) 881-835 (8.4%)
D-3 Iron IB-IIA transition	4816	48103	Olive pits Charcoal	GrA-12889 GrA-16848	2870 ± 70 2895 ± 40	-25.29 <i>-24.41</i>	2870 ± 70	1188-1181 (2.1%) 1150-1144 (1.6%) 1128- 970 (55.2%) 960- 928 (9.3%)	1260-1228 (3.8%) 1221- 894 (88.8%) 878- 839 (2.9%)
D-3 Iron IB-IIA transition	4830	48115	Olive pits	GrA-21044 GrA-21056 GrA-21183	2845 ± 35 2825 ± 35 2820 ± 50	-22.05 -23.30 -23.35	2832 ± 22	1004-970 (40.0%) 959-934 (28.2%)	1044-918 (95.4%)
D-4 Iron IB	1836	48450	Olive pits	GrN-26121 GrA-18825	2890 ± 30 2870 ± 50	-22.95 -22.99	2885 ± 26	1125-1119 (3.3%) 1112-1098 (10.0%) 1087-1059 (18.0%) 1053-1005 (36.9%)	1189-1179 (2.9%) 1154-1143 (2.2%) 1129- 996 (86.3%) 990-974 (2.5%) 955-943 (1.6%)
D-4 Iron IB	1845	48556	Seeds	GrA-21046 GrA-21057 GrA-21184	2905 ± 35 2945 ± 35 2920 ± 50	-22.49 -23.10 -24.12	2924 ± 22	1208-1202 (3.6%) 1189-1179 (7.2%) 1154-1142 (8.1%) 1129-1108 (15.1%) 1102-1067 (23.7%) 1065-1050 (10.4%)	1254-1244 (2.3%) 1212-1199 (6.2%) 1192-1139 (25.7%) 1132-1020 (61.2%)
D-4 Iron IB	1845	28243	Olive pits	<i>RT-3121</i>	<i>2800 ± 40</i>	<i>-21.10</i>	<i>same</i>	<i>999- 902 (68.2%)</i>	<i>1044-887 (81.6%) 884-833 (13.8%)</i>
D-6 Iron IA	1876	28536	Olive pits	<i>RT-3119</i>	<i>2685 ± 40</i>	<i>-20.70</i>	<i>same</i>	<i>896-876 (18.1%) 858-852 (4.2%) 841-802 (45.9%)</i>	<i>905-797 (95.4%)</i>
D-6 Iron IA	2836	28352	Olive pits	GrN-26118 GrA-18826	2930 ± 30 2950 ± 50	-22.28 -22.46	2928 ± 26	1209-1201 (5.1%) 1190-1178 (7.9%) 1159-1141 (11.3%) 1130-1108 (13.8%) 1102-1067 (20.8%) 1066-1050 (9.2%)	1257-1239 (4.9%) 1213-1197 (7.4%) 1194-1138 (28.1%) 1133-1018 (55.0%)
D-6 Iron IA	2874	28901	Olive pits	GrA-19034 GrN-26120	2935 ± 45 2880 ± 30	-22.14 -22.36	2897 ± 25	1126-1040 (60.6%) 1032-1020 (7.6%)	1210-1200 (2.0%) 1191-1177 (4.5%) 1161-1141 (4.6%) 1130-1000 (84.3%)

Table 2 Radiocarbon dating results from Area D at Tel Rehov, showing stratigraphic relationships. Most dates are from Groningen (GrN signifies measurement by PGC and GrA by AMS). All three dates from Rehovot (RT) are much younger and should be rejected in this intercomparison of three labs. The 18 Groningen dates in this list had only one outlier (GrN-26119), which is also rejected (all rejections in *italics*). The other 17 Groningen dates constitute a coherent set of measurements

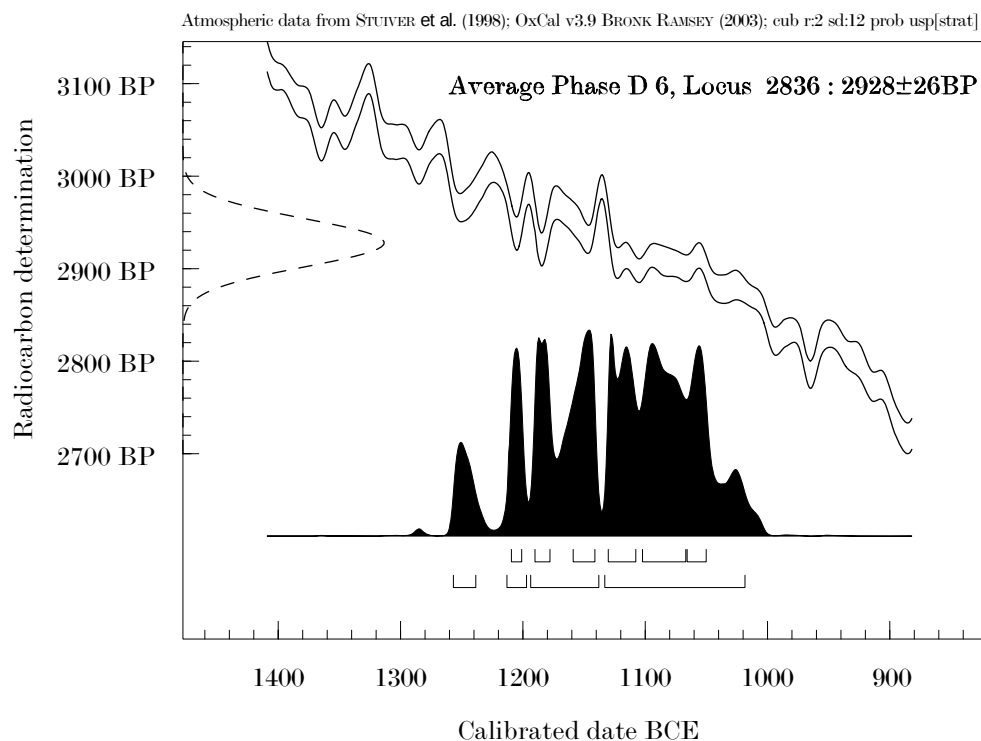


Fig. 4 Calibrated date of Iron IA, Phase D6, Locus 2836, using OxCal v3.9 (BRONK RAMSEY 2003) and the INTCAL 98 calibration curve (STUIVER and VAN DER PLICHT 1998). (Concerning the subsequent calibration figures, OxCal and INTCAL 98 are also used, see always above graph, but not mentioned repeatedly in the lower caption)

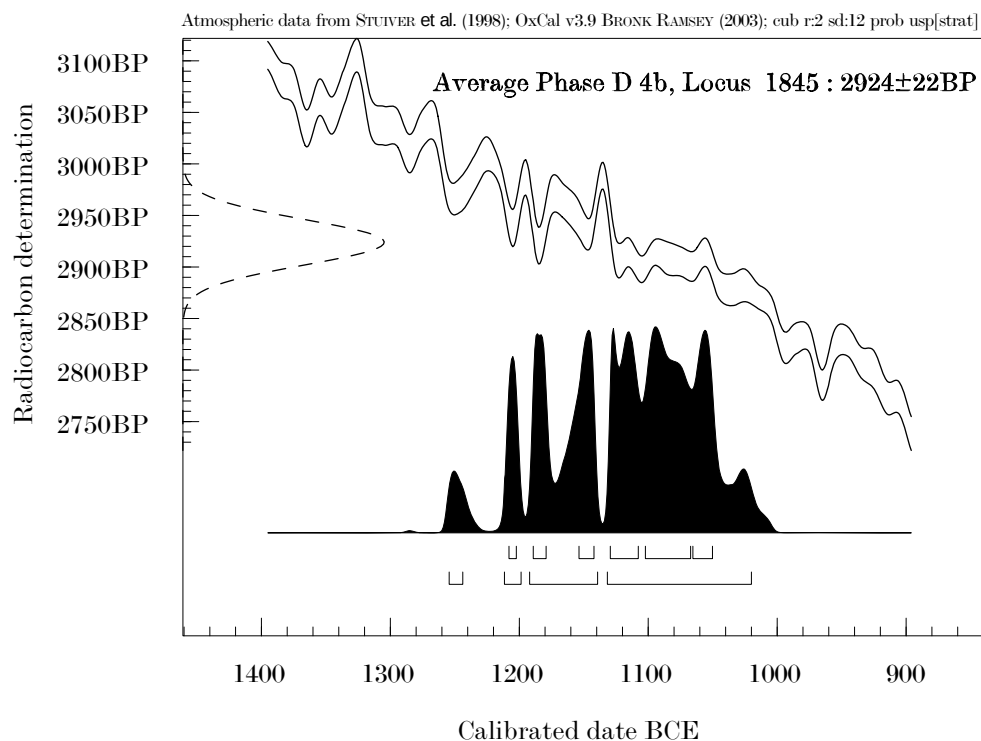


Fig. 5 Calibrated date of Iron IB, Phase D4b, Locus 1845

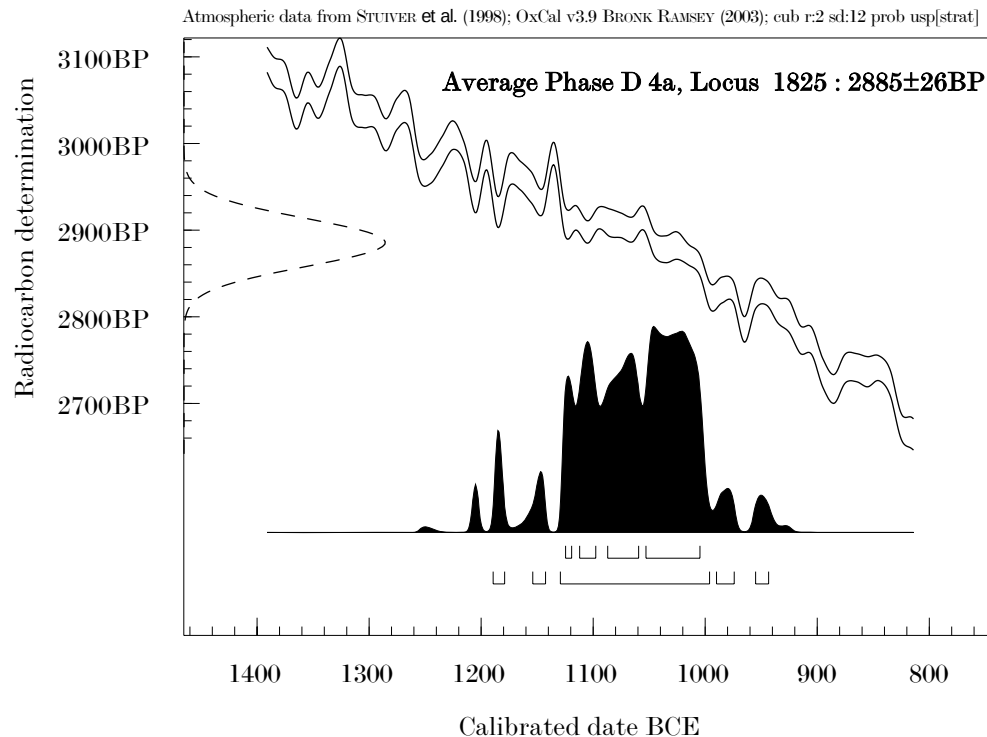


Fig. 6 Calibrated date of Iron IB, Phase D-4a, Locus 1825

raised from time to time during the duration of Phase D-4, resulting in a succession of striated surfaces. The ceramic assemblage from this phase is typical for the Iron Age IB period (Fig. 3a; for further discussion of the pottery see MAZAR *et al.* 2005).

A sizable cluster of charred seeds was found on the cobble floor of the courtyard (Locus 1845) of Phase D-4b, below thick accumulation of occupation striations. Therefore, the archaeological context of the seeds is first grade. The seeds were dated at the Weizmann Institute in Rehovot and also at the University of Groningen. The ¹⁴C determination at Rehovot gave a date of 2800 ± 40 BP (RT-3121) (MAZAR and CARMI 2001:1336 Table 3), while three AMS dates of seeds from the same locus in Groningen gave consistently older dates: 2905 ± 35 BP (GrA-21046), 2945 ± 35 BP (GrA-21057) and 2920 ± 50 BP (GrA-21184). The Groningen results are close to each other, mostly within 1σ , indicating high-quality dates with robust repeatability (SCOTT 2003). The Groningen weighted average for Locus 1845 of Phase D4 is 2924 ± 22 yr BP. The single Rehovot date is about 124 radiocarbon years younger, which would result in a calibrated age range in the 10th century BCE, which is generally considered too young for Iron IB. However, the consistent Groningen results give an older calibrated 1σ age range of 1208–1050 BCE (Fig. 5) for Phase D-4b.

The principle of stratified archaeological wiggle matching (BRUINS, VAN DER PLICHT and MAZAR 2003a) demands that successive layers cannot have the same position on the calibration curve but must follow each other in time. Taking into consideration the stratigraphic sequence of Phase D-4 above the unexcavated Phase D-5 and the position of the latter above the dated Phase D-6, a date of ca. 1100–1050 BCE seems most likely for Phase D-4b.

In Locus 1825 (Phase D-4a), a cluster of charred olive pits was found on the highest floor surface among those that occur above cobble floor 1845. The olive pits were dated in Groningen by both the PGC and AMS lab facilities. The results of the same sample by these two different ¹⁴C measurement techniques gave very similar dates, which underline the outstanding reproducibility (SCOTT *et al.* 1998; SCOTT 2003) status of both facilities in Groningen. The PGC result is 2890 ± 30 yr BP (GrN-26121) and the AMS result is 2870 ± 50 yr BP (GrA-18825), giving a weighted average of 2885 ± 26 yr BP which is about 39 radiocarbon years younger than the Phase D4b sample found on the cobble floor below. This may provide a reasonable time range for the accumulation of floor surfaces in the same place during phases D-4b and D-4a.

A reasonable date for Phase D-4a within the calibrated age range (Fig. 6), considering the BP difference (40 yr) with cobble floor 1845 and the principle of

stratified archaeological wiggle matching, would be *ca* 1060–1010 BCE. The Groningen radiocarbon dates agree very well with the conventional archaeological dates for the Iron IB pottery, found in Phase D-4.

Phase D-3

Phase D-3 in Area D included a very peculiar feature: more than 30 small and shallow pits were found concentrated in an accumulation layer less than one meter thick. Some of the pits penetrated the underlying destruction debris of Phase D-4 and also cut each other. The human activities recorded by these pits seem to represent a considerable time span. Some of the pits were plastered with thin white plaster. The pits contained only small amounts of pottery sherds of homogeneous types, which can be classified to the end of Iron I (Fig. 3b). The layer of pits is sealed by Locus 1802 (Phase D-2), a thick layer of refuse that is characterised by distinct Iron IIA pottery, related to Strata V and VI in the adjacent Area C.

The pits were probably used for refuse disposal and/or food storage. Each pit of Phase D-3 represents a homogeneous feature from a stratigraphic viewpoint, situated in between D-4 and D-2. It does not mean of course that each pit was made and used exactly at the same time, yet the entire accumulation of pits is sealed from above and below by distinct stratigraphic features. The organic samples found in these pits are not isolated single seeds but clusters of olive stones, albeit in small concentrations. Thus there is no foundation for the charge by FINKELSTEIN and PIASETZKY (2003a) that these pits are an unreliable context for our ^{14}C dates (BRUINS, VAN DER PLICHT and MAZAR 2003a, 2003b).

Phase D-3 – Pit 4830

A cluster of charred olive stones was found (basket 48115) at the bottom level (85.15) of a shallow pit (Locus 4830) in Square Q4 within levels 85.35–85.15. The sample was investigated in Groningen, where, following standard pre-treatment, three sub-samples were prepared for measurement by AMS. The triplicate results are as follows: 2845 ± 35 BP (GrA-21044), 2825 ± 35 BP (GrA-21056), 2820 ± 50 BP (GrA-21183). The three measurements are very close, within 1σ from each other, which underlines the measurement repeatability quality of the AMS facility. The weighted average date of the three measurements is 2832 ± 22 BP.

The calibrated age (Fig. 7) gives two possible options in the 1σ range: 1004–970 (40.0%) and 959–934 (28.2%). The first period 1004–970 has clearly the highest relative probability. This result fits

very well with the suggestion by MAZAR (above) to place the boundary for the transition from Iron I to Iron IIA at about 980 BCE. Both calibrated radiocarbon date options are clearly too old for the Low Chronology theory, which places the above transition approximately at 920 BCE.

Phase D-3 – Pit 4816

This is a plastered pit cut into mudbrick wall 4859 of Phase D-4. It had two plastered surfaces inside, and the sample (Basket 48103) of charred olive stone fragments and fine charcoal was found between these two surfaces at level 85.67m. Thus this is a closed context. The charred olive stone fragments were dated in Groningen by AMS, giving a date of 2870 ± 70 BP (GrA-12889). The amount of material was small, even for AMS, resulting in a somewhat larger standard deviation. The fine charcoal was dated separately, also by AMS, giving a date of 2895 ± 40 BP (GrA-16848). The results are close to each other, within 1σ , which gives confidence in their reliability, while the charcoal is slightly older than the olive pit fragments, as might be expected. Looking closer at the date for the olive pit fragments, the BP result is the same as the youngest date (GrA-18825) for Phase D4a. Therefore, this pit (Locus 4816) is older than the former (Locus 4830) and reflects human activities in the 11th century BCE.

Phase D-3 – Pit 4815

This is a non-plastered pit within levels 85.53–84.76, in which a cluster of 15 charred olive stones was found at level 85.11 (Basket 48105). Some of these olive stones were measured in Groningen by AMS, yielding a date of 2820 ± 50 BP (GrA-16757). This dating result is very similar as those for Pit 4830. As we have only one AMS date, the relatively large standard deviation of 50 BP years results in a calibrated date with a wide age range (Fig. 8). The 1σ ranges are 1042–1031 (3.8%) and 1022–901 (64.4%) BCE.

The time resolution of the radiocarbon date in this case is not sufficient to distinguish unambiguously between 980 or 920 BCE as possible dates for the transition between Iron I and Iron IIA, as both options fall within the 1σ result. Nevertheless, 980 BCE is clearly situated in the central most likely part of the calibration result, whereas 920 BCE is located at the young margin of the ^{14}C outcome (Fig. 8), which has a lower probability level.

This particular result underlines the significance of high-precision dates with a low standard deviation (BRUINS and MOOK 1989; VAN DER PLICHT and BRUINS 2001). Such results can be obtained with the PGC tech-

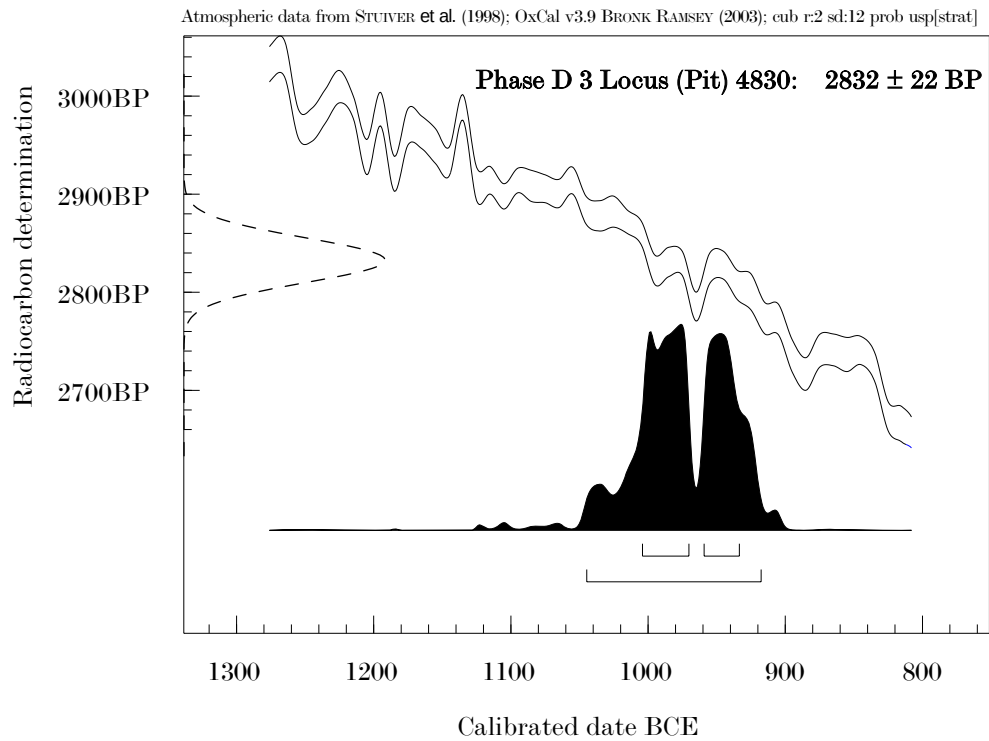


Fig. 7 Calibrated date of one of the storage/refuse pits (Locus 4830) in Phase D-3

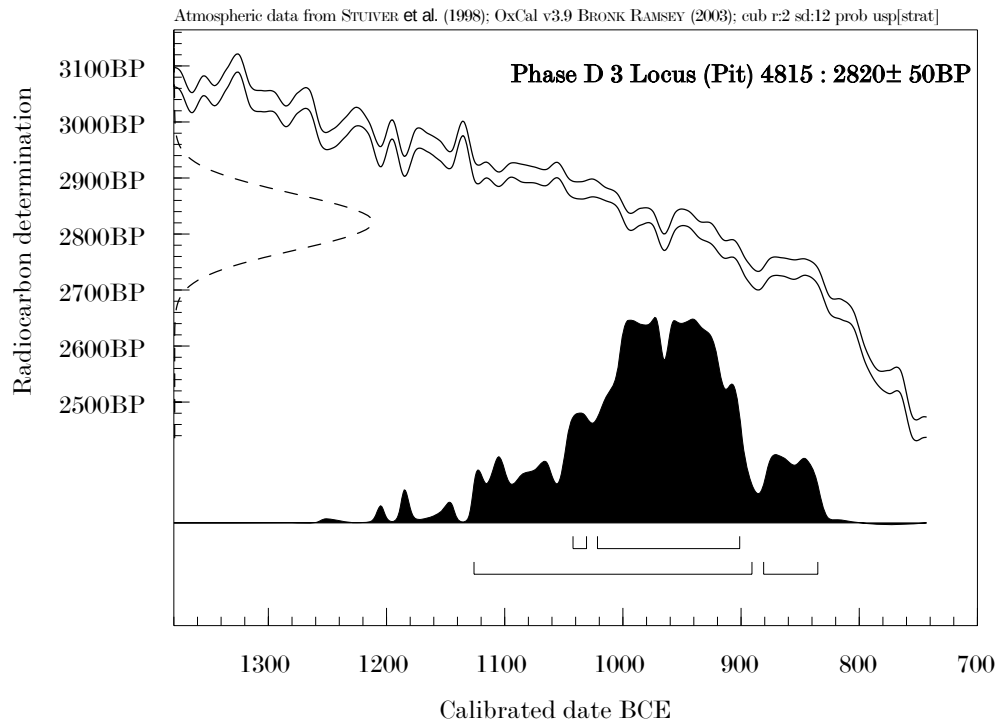


Fig. 8 Calibrated date of one of the storage/refuse pits (Locus 4815) in Phase D3

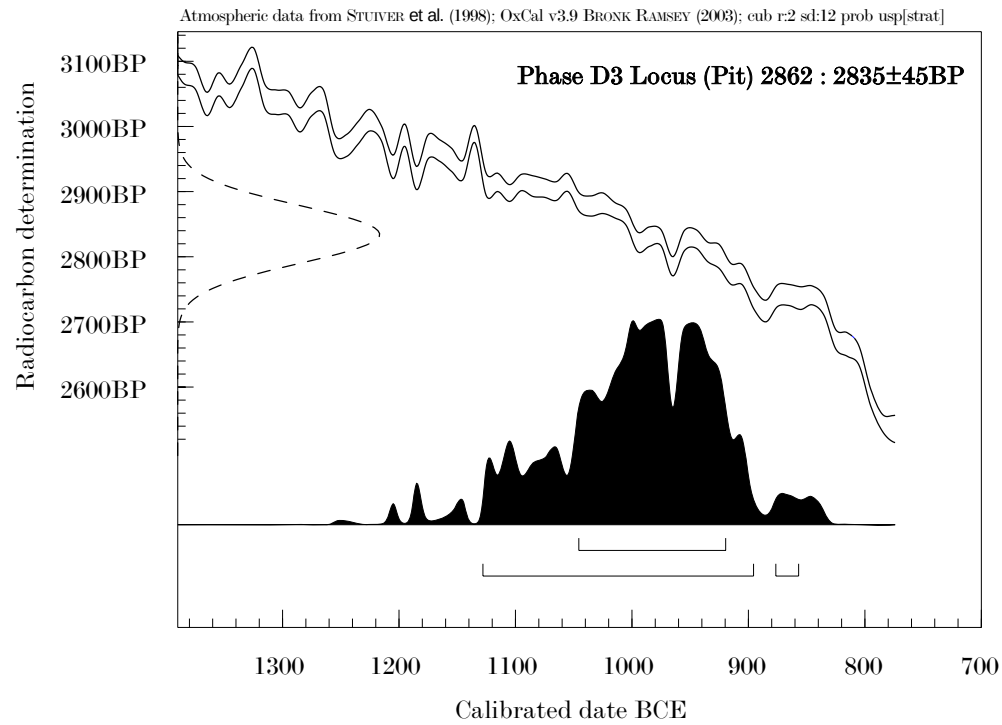


Fig. 9 Calibrated date of one of the storage/refuse pits (Locus 2862) in Phase D3

Stratum	Area and Local Phase	Locus	Lab No	¹⁴ C Date (BP)	¹⁴ C Date BP or Average used in calibration	1 s Calibrated Date 1998 Curve OxCal v3.9 (year BCE)	2 s Calibrated Date 1998 Curve OxCal v3.9 (year BCE)	Ceramic type and context
IV	C-1a	5498	GrA-21152 GrA-21154 GrA-21267	2770 ± 50 2730 ± 50 2760 ± 35	2755 ± 25	918–893 (25.0%) 879–837 (43.2%)	970–959 (6.0%) 934–830 (89.4%)	Building F Stratum IV Destruction
V	B-5	4218	GrA-21034 GrA-21047 GrA-21179	2760 ± 35 2820 ± 35 2770 ± 50	2786 ± 22	995–991 (1.9%) 973–956 (19.4%) 942–899 (46.9%)	999–895 (83.7%) 877–841 (11.7%)	Stratum V Destruction
V	C-1b	2422	GrN-27361 GrN-27362 GrN-27412	2764 ± 11 2777 ± 13 2785 ± 28	2771 ± 8	969–961 (11.2%) 925–897 (55.7%) 872–870 (1.3%)	970–959 (12.7%) 935–894 (62.0%) 878–840 (20.7%)	Stratum V Destruction
V	C-1b	2425	GrN-26114 GrN-26115	2775 ± 20 2800 ± 20	2788 ± 14	971–959 (20.7%) 935–903 (47.5%)	998–981 (5.7%) 976–896 (86.9%) 876–860 (2.8%)	Building G Silo room Stratum V Destruction
V	C-1b	2441	GrN-26116 GrN-26117 GrN-27385 GrN-27386	2810 ± 20 2775 ± 25 2771 ± 15 2761 ± 15	2776 ± 9	969–960 (15.2%) 925–899 (53.0%)	971–958 (18.2%) 938–895 (64.6%) 877–843 (12.6%)	Building G Stratum V Destruction
VI	C-2	4426	GrN-27366	2761 ± 14	2761 ± 14	919–896 (34.5%) 877–857 (21.4%) 853–841 (12.3%)	969–960 (5.9%) 929–888 (43.4%) 883–834 (46.1%)	Building A Stratum VI
VI	C-2	4426	GrA-21043 GrA-21054 GrA-21182	2755 ± 35 2805 ± 35 2800 ± 50	2784 ± 22	995–991 (2.0%) 973–956 (18.8%) 942–898 (47.4%)	998–981 (6.9%) 977–894 (74.1%) 878–839 (14.4%)	Building A Stratum VI
V/VI	D-2	1802	GrN-26112	2805 ± 15	2805 ± 15	997–989 (8.5%) 974–954 (25.9%) 944–919 (33.8%)	999–913 (91.8%) 912–905 (3.6%)	Refuse deposits from Strata VI and V

Table 3 Calibrated Groningen radiocarbon dates of Tel Rehov Iron IIA Strata, in relation to the stratigraphy and archaeological context

nique if the sample is large enough, usually 20 grams or more. Multiple measurements with AMS of the same organic sample will also enable the calculation of a weighted average with a relatively low standard deviation. The previous Pit 4830 is a good example. The triplicate results 2845 ± 35 BP (GrA-21044), 2825 ± 35 BP (GrA-21056), 2820 ± 50 BP (GrA-21183) gave a weighted average date of 2832 ± 22 BP. Notice that GrA-21056 within this series is exactly identical with the single date for Pit 4815. This suggests that both pits were used in the same time period.

Phase D-3 – Pit 2862

This is a shallow plastered pit, in which a cluster of several charred olive stones was found at level 85.62 (Basket 28493). The sample was dated in Groningen both by AMS and PGC. The AMS measurement gave a date of 2835 ± 45 BP (GrA-19033), which is very similar to the dating results for Pit 4815 and Pit 4830. The Proportional Gas Counter (PGC) produced in this case a rare outlier (difference of about 4σ), which is clearly too young: 2720 ± 30 BP (GrN-26119). Since the difference between the two dates is beyond 2σ , it is not acceptable to calculate a weighted average. The AMS date should be regarded as reliable, fitting many of the other dates for Phase D-3.

The calibrated result of this date (Fig. 9) is again rather wide, due to the standard deviation of 45 years of the BP date (GrA-19033). The 1σ age range is 1046–920 (68.2%) BCE. The time resolution of this result is not sufficient to separate unambiguously between the 980 and 920 BCE options for the transition between Iron I and Iron IIA. However, 980 BCE is again located in the most probable central part of the calibrated date, while 920 BCE is situated at the lower boundary of the 1σ range.

Phase D-3 – Pit 1858

Pit 1858 in Square P4 is a 0.94 m deep pit in which four successive plastered floor surfaces were defined. One sample of olive stones found at the middle level of this pit was measured by the ^{14}C laboratory in Rehovot (RT-3120). The date of 2670 ± 40 BP (RT-3120) is definitely too young and the calibrated age in the 9th century BCE is much too low for the pottery assemblage found in Phase D-3 (MAZAR and CARMI 2001:1336).

THE IRON AGE IIA

The Iron Age IIA period will only be treated in this article in relation to our age assessment for the transition between Iron I and Iron II. The excavations at Tel Rehov exhibited widespread exposures of the

Iron Age IIA period in six different excavation areas. Separate stratigraphic phases were counted in each one of these areas (MAZAR 1999, for results of the first two seasons). The correlation of the various local phases into a comprehensive stratigraphic frame is not easy, but our current understanding is represented by three general strata numbers: VI, V and IV (Table 1). Both the local phases and general strata numbers are mentioned in Table 3, in relation to the 20 coherent Groningen radiocarbon dates of Iron Age IIA layers (BRUINS, VAN DER PLICHT, MAZAR 2003a): 16 from Area C, three from Area B and one from Area D (Phase D-2). Another 18 radiocarbon dates from Locus 2425 in Area C were measured at Rehovot and Arizona and published earlier, as well as three dates of charred beams from this period measured at Rehovot (MAZAR and CARMI 2001:1337–1339).

Area D – Phase D-2

This phase in Area D included a one meter thick layer of refuse debris (levels 87.19–86.10 m) close to the slope of the mound, containing homogeneous Iron IIA pottery. This refuse was probably dumped from the nearby buildings in Area C (Phases C-2 and C-1b; general Strata VI and V). A cluster of olive stones came from the lowest level of this debris layer (Square D2, Basket 18119, level 86.11).

The single PGC radiocarbon measurement of the relatively large sample of olive pits, conducted in Groningen, resulted in a high-precision date with a low standard deviation: 2805 ± 15 BP (GrN-26112). The calibration of this precise date into calendar years (Fig. 10) gives, however, a wider range, due to the wiggles in the calibration curve. Both the 1σ and 2σ range cover the entire 10th century BCE. This result is, nevertheless, significant, because Iron IIA in the Low Chronology view should be mainly situated in the 9th century BCE, while the above result places Phase D-2 exclusively in the 10th century BCE. Although the last 20 years of the 10th century BCE are still acceptable in the Low Chronology view, this range has a probability of only 3.6% out of a total of 95.4% ($= 2\sigma$).

Area C – Stratum VI

The town and associated buildings of Stratum VI in Area C (local Phase C-2) belong to the earlier part of the Iron IIA period. The pottery from this stratum is somewhat different from that of the following two strata (V and IV), yet it definitely belongs to the Iron IIA period. Red slip and burnish are abundant here, but entirely absent in the earlier Iron I period, including the pits of Phase D-3. The samples dated at

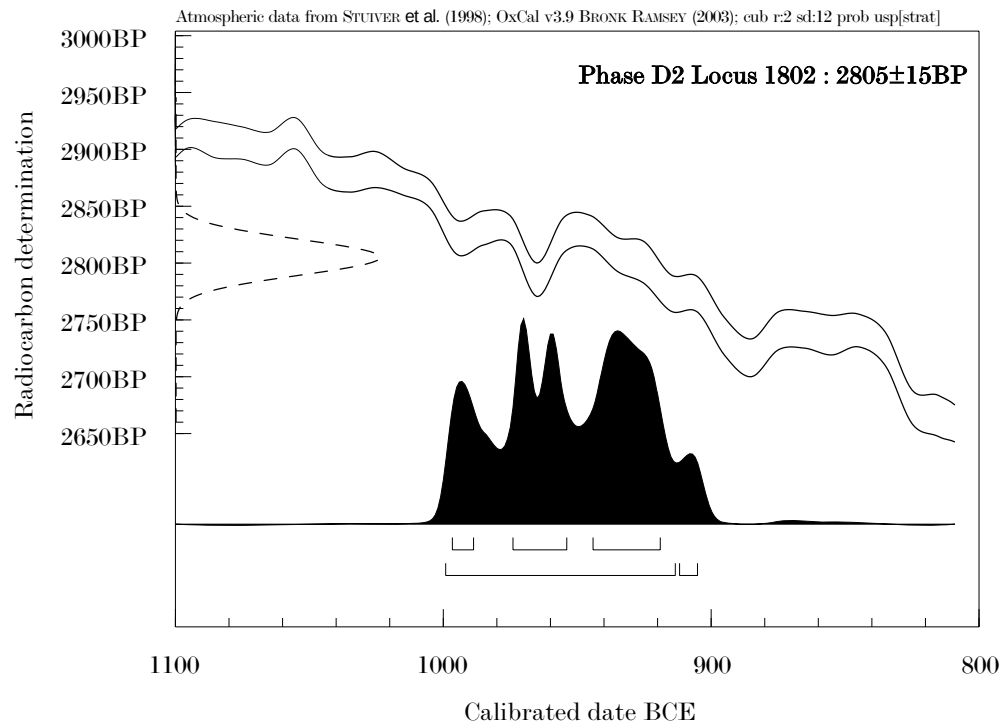


Fig. 10 Calibrated date (GrN-26112) of a large cluster of charred olive stones from the Iron IIA layer in Area D (Phase D-2, Locus 1802)

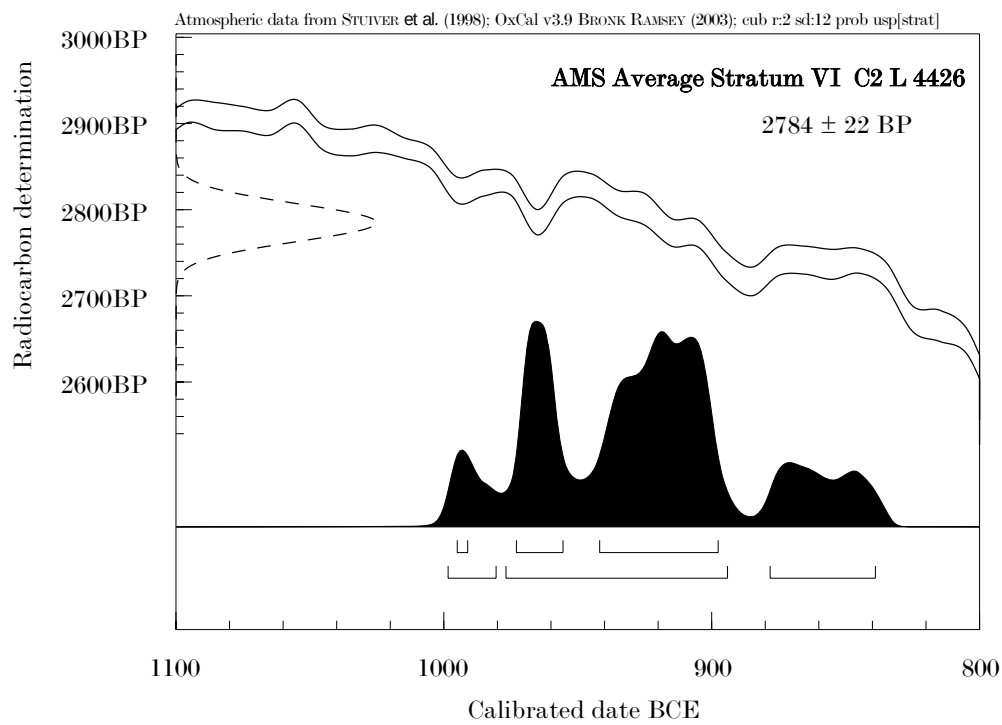


Fig. 11 The average of three AMS dates (2784 ± 22 BP) of Iron IIA Stratum VI in Area C (Phase C2), calibrated into calendar years

Groningen came from Locus 4426 in Building D (Basket 44166, level 85.45), a beaten earth floor in a room, covered by a 0.85 m thick layer of occupation debris and decayed bricks. The sample consisted of a cluster of charred grains found above the floor. The amount of grains was large enough to make one measurement in Groningen with PGC, which resulted in a high-precision date with a small standard deviation: 2761 ± 14 yr BP (GrN-27366).

However, a remaining fraction of the sample, composed of charred broken grains and fine charcoal was dated in triplicate by AMS. One should not be alarmed here by the word “charcoal”, because the fine black powder amongst the broken grains is most likely derived from the seeds or associated short-lived material (threshing remains, husks). No wood remains were seen. Two of the AMS dates gave similar results: 2805 ± 35 yr BP (GrA-21054) and 2800 ± 50 yr BP (GrA-21182). A third AMS measurement yielded a somewhat younger date: 2755 ± 35 yr BP (GrA-21043). Since the younger AMS date is still within its 2σ range from the two older dates, the result is statistically acceptable. The two older dates are practically the same as the date for Phase D-2, described above. The weighted average of the three AMS dates is 2784 ± 22 BP.

The difference between the above average AMS date (based on three measurements) and the single PGC date (2761 ± 14 yr BP, GrN-27366) is only 23 radiocarbon BP years. Such a small difference is fully acceptable in the physical sense of radiocarbon dating, as 2761 ± 14 and 2784 ± 22 overlap well within 1σ . However, in archaeological terms, the difference becomes, in this case, significant after calibration in calendar years. The 1σ calibrated age range of the average AMS date is 995–991 (2.0%), 973–956 (18.8%), 942–898 (47.4%) BCE (Fig. 11). This result is almost entirely situated in the 10th century BCE. On the other hand the 1σ calibrated age range of the single PGC date is significantly younger: 919–896 (34.5%), 877–857 (21.4%), 853–841 (12.3%). This gives two distinct options in the 9th century BCE, while the range with the highest relative probability is in the last 20 years of the 10th century BCE.

Looking at the calibration curve (Figure 11), it is clear that the BP date of the AMS average “hits” the calibration curve at two principal spots: (1) the wiggle between 980–950 BCE and the younger area between 940–900 BCE. The latter option has the highest relative probability (47.4%) as compared to 18.8% for the older option of 973–956 BCE. The last 40 years of the 10th century BCE are statistically favoured, because this section represents more “prob-

ability volume” in the calibration curve than the section of the wiggle around 970 BCE.

Nevertheless, stratified archaeological wiggle matching does give preference to the “first hit” with the calibration curve around 970 BCE, because successive layers cannot have the same position on the calibration curve but must follow each other in time (BRUNS, VAN DER PLICHT and MAZAR, 2003a:316). Stratum VI is to be placed on the calibration curve between the position of Phase D-3 (Stratum VII) and Stratum V. The many high-quality dates from the destruction layer of Stratum V (Table 3) clearly favour the last 40 years of the 10th century BCE (Figure 12 and 13). Moreover, the dates for Stratum V relate to the very end of this city. Its period of existence must predate these radiocarbon dates by a certain time span. Hence it seems inconceivable in stratigraphic terms to date Stratum VI to the same period as V. There are also clear differences between the pottery assemblages of these two strata, as the ceramic remains of Stratum VI are somewhat older than Stratum V. Therefore, putting all the criteria together, Stratum VI (Phase C-2 in Area C) would fit best in the period 975–950 BCE, the second most likely period in the 1σ range of the calibrated age of the average AMS date.

Radiocarbon BP dates for the calendar period 975–950 are *younger or similar* in age as compared to BP dates of the *later* calendar period 950–910, due to the wiggle of 975–950 BCE. The somewhat younger PGC date (GrN-27366) may, therefore, be compatible with this wiggle. It is important to realize that the wiggle is based on dendrochronological data through radiocarbon measurements of groups of 10 tree-rings (decadal) or 20 tree-rings (bidecadal) (STUIVER *et al.*, 1998). The radiocarbon measurements of Stratum VI are based on a short-lived sample –seeds– with a time span of about one year or even less (growing season). Past ¹⁴C variations in the atmosphere are not captured in such detail by the calibration curve itself, due to the comparatively “coarse” decadal and bidecadal measurements. Therefore, it might be important in this case to make a special primary study of this wiggle through ¹⁴C measurements by AMS of each individual tree ring in the available dendrochronological series for the period 980–940 BCE or even for the entire 10th century. Such detailed measurements have been carried out for older Bronze Age periods (VOGEL and VAN DER PLICHT, 1993).

Area C – Strata V and IV

These younger strata within the Iron Age IIA period are outside the focus of this paper, which deals with Iron Age I and the transition to Iron IIA. Extensive

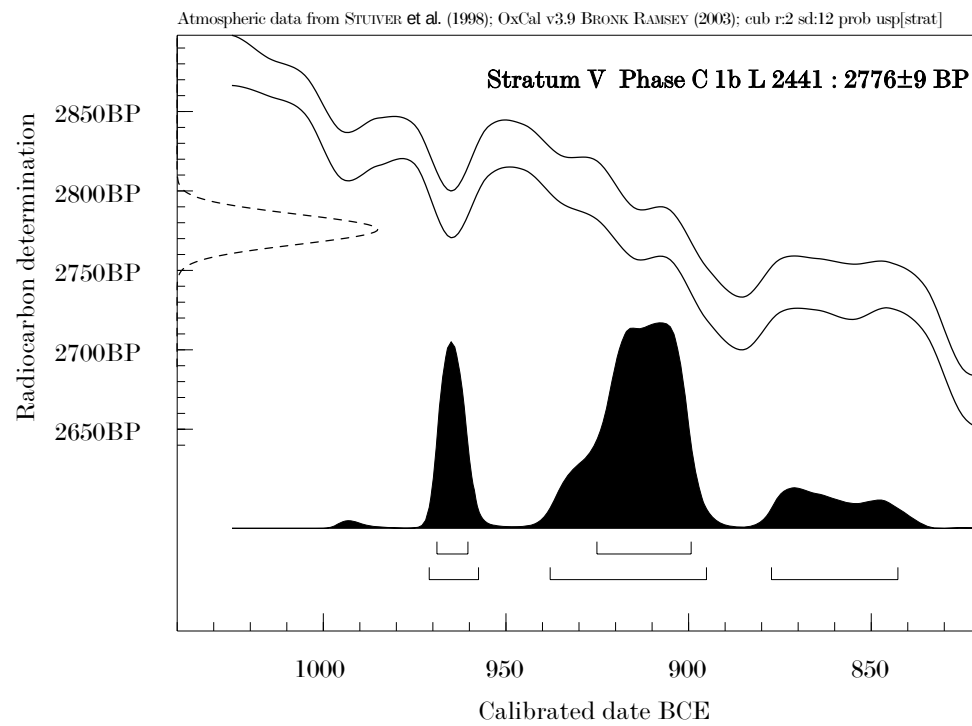


Fig. 12 The average of three Groningen AMS dates (2776 ± 9 BP) of Iron IIA Stratum V in Area C (Phase C-1b)

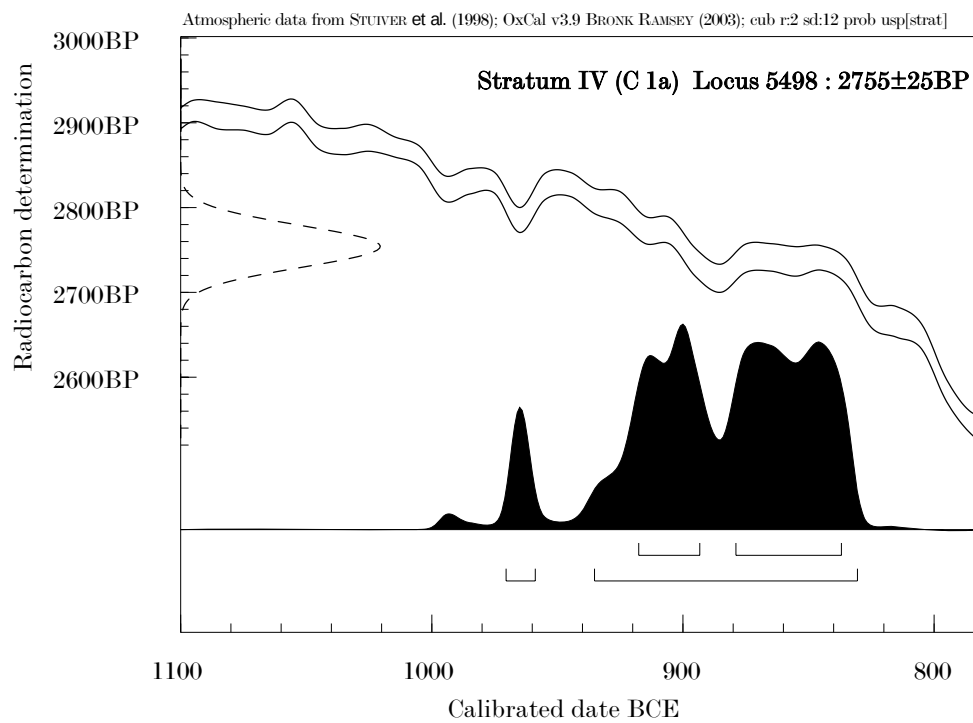


Fig. 13 The average of three Groningen AMS dates (2784 ± 22 BP) of Iron IIA Stratum VI in area C (Phase C2)

treatment of the Tel Rehov radiocarbon dates of these latter strata (shown in Table 3) will be published elsewhere (MAZAR *et al.* 2005). For the sake of comparison with radiocarbon results from older layers, the calibration of the average date of Stratum V Locus 2441 is shown in Fig. 12. Four PGC dates from relatively large, charred, cereal grain samples found above a floor under a thick destruction layer gave a weighted average of 2776 ± 9 BP. The very small standard deviation results from the averaging calculation of the included dates, which have standard deviations in the range of 14 to 25. The 1σ calibrated age gives the ranges 969–960 (15.2%) and 925–899 (53.0%) BCE, but excludes the 9th century. The 2σ calibrated range of course gives a wider spectrum: 971–958 (18.2%), 938–895 (64.6%), 877–843 (12.6%). Thus the 9th century has a probability of only 13% out of 95%. The most likely 2σ range for the destruction of city V is the period 938–895 BCE with a probability of 65%.

As Rehov is mentioned in the list of places raided by Pharaoh Shoshenq I (Shishak) during his military campaign (KITCHEN 1986: 187–239; B. MAZAR 1986), we cannot ignore these literary sources in the evaluation of our ¹⁴C time series. It is quite fascinating that our radiocarbon dates for the destruction of Stratum V are more or less in the same time span as historical assessments for the period of Shoshenq I (BRUINS, VAN DER PLICHT and MAZAR 2003a). The precise time of Shoshenq's campaign is unclear; the year 925 suggested by KITCHEN is most widely cited, but his argumentation depends to a large extent on biblical chronology and leaves the door open for somewhat higher or lower options (KITCHEN 1986: 187–239; 2000:40–41). It is difficult for intrinsic reasons to prove a correlation between a destruction layer and a historical event. Yet in our case the association seems logical and fitting the circumstances.⁵

Concerning the comparison between the dates of Locus 2425, as dated in Rehovot and Arizona, and in Groningen by both PGC and AMS, see BRUINS, VAN DER PLICHT, MAZAR (2003b). A more detailed treatment of these differences will be presented in a future paper dealing extensively with Iron Age IIA. For a more detailed treatment of these differences see MAZAR *et al.* 2005.

Stratum IV (local Phase C-1a) is the youngest Iron IIA Stratum at Tel Rehov. A sample of charred cereal grains from this Stratum was investigated in

Groningen by AMS dating. The sample came from Locus 5498, of Building F in Area C, a room in a very well preserved building with mudbrick walls standing to a height of over one meter. The grain sample (Basket 54702) was found inside a pottery jug above the floor at level 86.10 m, covered by 1.18 m thick destruction debris. Many restorable pottery vessels and a unique cult object were found in this room. The three AMS dates 2770 ± 50 (GrA-21152); 2730 ± 50 (GrA-21154) and 2760 ± 35 (GrA-21267) form a robust series, as the results show excellent repeatability within one standard deviation from each other. The weighted average date of 2755 ± 25 yr BP gives a calibrated age in the 1σ range with two options: 918–893 (25.0%) and 879–837 (43.2%). Though the last 18 years of the 10th century BCE have still a relatively high relative probability, the 9th century period of 879–837 is clearly favoured with 43.2%. The calibrated results in the 2σ range are 970–959 (6.0%) and 934–830 (89.4%).

The destruction of Stratum IV and the abandonment of the lower city at Tel Rehov most probably occurred during the 9th century prior to *ca* 830 BCE. This event may be related to one of the historical episodes during this period. The wars between Israel and Aram during the time of Hazael *ca* 840–830 BCE are reasonable options, though earlier events in the 9th century should not be excluded.

CONCLUSIONS

Quality control in radiocarbon dating is important in order to have meaningful results in the historical archaeological periods of the Near East (VAN DER PLICHT and BRUINS 2001; SCOTT 2003). Both archaeological and physical elements are involved. The Groningen dates of Tel Rehov come from a detailed stratigraphic series of reliable sequenced contexts, each providing short-lived samples. In physical scientific terms, internal quality assessment and lab inter-comparison of the Groningen dates are based on two fundamentally different radiocarbon techniques, (pre)treated and measured in two independent laboratories – Conventional PGC (GrN) and AMS (GrA). The repeatability of the measurements, which is a most important indicator of quality and accuracy, is generally outstanding. There are only few exceptions. Sometimes, the difference is slightly problematic, as the resolution of radiocarbon dating is pushed to the limit. This was the case for the lower part of Phase

⁵ FINKELSTEIN and PIASETZKY (2003b: 286–277) don't accept this correlation. Instead, they suggest an absurd historical reconstruction. A detailed reply will be published elsewhere.

D6 (Locus 2874) and for Stratum VI. However, the age difference in both cases between the PGC and AMS dates is still within 2σ , which shows that we are really touching upon system resolution rather than apparent mistakes.

Our research resulted, incidentally, also in an unplanned intercomparison with radiocarbon dates from Rehovot, as the same samples or loci were measured in certain cases by three labs: Groningen PGC, Groningen AMS and Rehovot. It is indeed worrying that all Rehovot dates of short-lived Iron I samples from Tel Rehov are younger than the two Groningen labs by a century or more. A similar difference between Groningen and Rehovot was already noted for most of the Iron Age IIA dates of Stratum V, Locus 2425 (BRUINS, VAN DER PLICHT and MAZAR 2003b).

It does not mean that other dates measured in Rehovot suffer from a similar bias.⁶ However, the serious discrepancies outlined above, make it inevitable that the Rehovot dates on samples from other sites like Dor and Megiddo (SHARON 2001; GILBOA and SHARON 2001; 2003; FINKELSTEIN and PIASETZKY 2003a, 2003b, 2003c) should now be examined also by other ^{14}C laboratories, including pretreatment and all steps involved.

Large deviations are not uncommon in radiometric measurements (SCOTT *et al.* 1998; SCOTT 2003). For example, the Radiocarbon Laboratory of the British Museum issued a detailed statement in 1990 that its radiocarbon dates measured in the period 1980–1984 were on average too young by 200–300 years (BOWMAN *et al.*, 1990). A retroactive re-evaluation of the dates was conducted, as far as possible, and the new, corrected dates were published, albeit with a necessary large standard deviation. Radiocarbon measurements in Groningen of short-lived Early Bronze Age samples from Jericho were indeed 200–300 years older than dates on similar samples measured in the British Museum Lab during 1980–1984 (BRUINS and VAN DER PLICHT 1998). This is another case of unplanned intercomparison, on EB samples, which incidentally underlines the accuracy of the Groningen dating record.

The Groningen ^{14}C series on short-lived charred organic material from Tel Rehov, presented together in stratigraphic order in the concluding Figure 14,

lead us to the following summary and conclusions concerning Iron Age I and the transition to Iron Age IIA:

1. The Iron Age IA of Phase D-6 in Area D has a calibrated 1σ age range that covers the entire 12th and part of the 11th centuries BCE. The slightly lower date for Locus 2874 is related to one date being somewhat younger, as compared to the other three dates of this phase, which are very coherent. Yet this date is still within the 2σ measurement range of the other D-6 samples. Ceramic types in both Phases D-7 and D-6 seem to favour a date in the 12th century BCE, possibly related to the time of Egyptian presence in the region during the 20th Dynasty, and to Strata S-4 and S-3 at Beth Shean (MAZAR 2003a: 324 Table 1; 333–337). Phase D-6 probably belongs to the last phase of this period.

2. Phase D-4 of the Iron Age IB has a calibrated 1σ age range that covers both the 12th and 11th centuries BCE. The many wiggles, coupled with the rather similar BP position of the calibration curve for this time period, make precise dating difficult. However, Phases D-6 and D-4 cannot occupy the same position on the calibration curve and thus Phase D-4 should be located in the younger part of the calibrated age range, *i.e.* in the 11th century BCE.

3. Phase D-3 has a calibrated 1σ age range that covers the last part of the 11th century BCE and the early 10th century BCE. This phase marks the transition from Iron I to Iron IIA.

4. Phase D-2 contains unambiguous types of Iron IIA pottery. Its 1σ calibrated age range covers the first 80 years of the 10th century BCE.

5. Phase C-2 (general Stratum VI) is stratigraphically the oldest Iron IIA city in Area C. The single PGC date is slightly younger than the average of three AMS dates. Taking the latter average, the 1σ calibrated age range covers the entire 10th century BCE. However, considering the detailed calibrated options (Table 3, Figure 11), coupled with the fact that successive Strata cannot occupy the same position on the calibration curve, the period 975–950 BCE, is favoured. A considerable time duration for phases C-2 (=VI) and C1b (=V) also fits the differences in the pottery assemblages of these two strata.

⁶ The 13 dates from Beth Shean measured in Rehovot (MAZAR and CARMI 2001; MAZAR 2003:332) appear to be acceptable, though most of them have a chronological range after calibration that is too wide for effective evaluation.

Attention that the criticism of our results by FINKELSTEIN and PIASETZKY (2003a, 2003b) is based to a significant extent on dates measured in Rehovot during the 1990's..

6. The calibration results of the various loci from Phase C-1b (=general Stratum V) place the highest relative probability within broadly the last 40 to 20 years of the 10th century BCE. The time span of the city must predate the radiocarbon results, based on charred grains found in the final destruction layer of this city. Hence the approximate period 950–910 BCE for Stratum V would fit well with the calibrated dates and stratigraphy.

7. Stratum IV is the last Iron Age IIA city at Tel Rehov. The dated charred cereal grains come again from a sealed destruction layer. The 1 σ calibrated age range for the end of city IV has one option in the last part of the 10th century BCE and a more likely option in the 9th century BCE, but not later than 830 BCE.

8. Our radiocarbon results show that the transition from Iron I to Iron IIA occurred during the first half of the 10th century BCE (Figure 14), though there is some overlapping between the end of the Iron Age I (Stratum D-3) and the suggested date for the Iron IIA (Phases D-2 and C-2 (=general Stratum VI), as should be expected for a transition boundary. The

suggestion by Finkelstein that the transition from Iron I to Iron IIA took place around 920 BCE, indicated by the blue line in Figure 14, clearly does not fit the radiocarbon dates.

9. The Iron IIA period had a rather long duration, including most of the 10th as well as the 9th centuries. This was already proposed by Aharoni and Amiran, by Ben-Tor, by Barkay and now also by Mazar, who suggests a time frame between 980–830 for this archaeological period.

10. The significance of our results for the debate concerning the archaeological nature of the United Monarchy is obvious: cultural assemblages traditionally dated to the 10th century (the assumed time of David and Solomon) can remain in this time period and don't have to be lowered to the 9th century, as proposed by Finkelstein's "Low Chronology". On the other hand, the longevity of the Iron IIA assemblages and their continuity into the 9th century leaves the door open for various interpretations to date specific buildings, such as the Megiddo palaces, either in the 10th or in the 9th century. Yet these issues are beyond the scope of this paper.

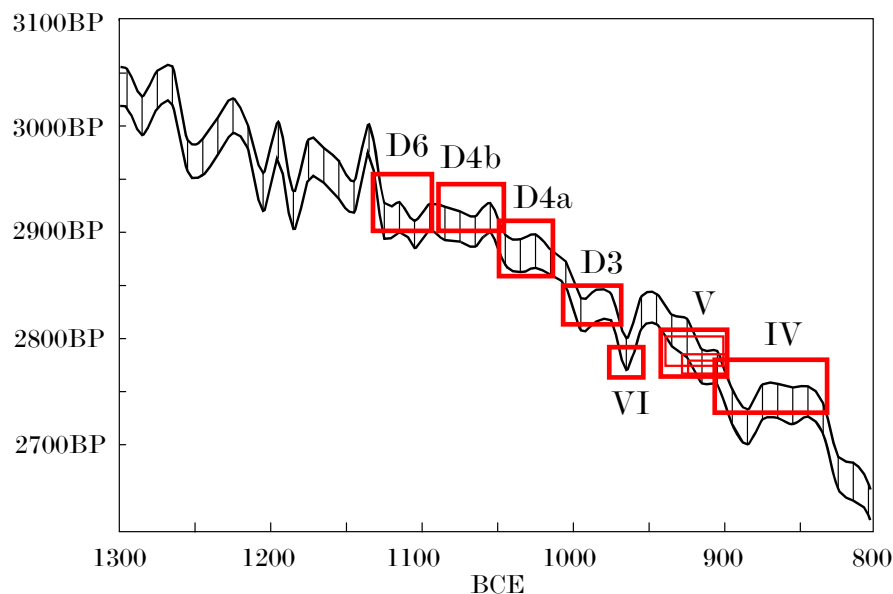


Fig. 14 Concluding graph (based on BRUINS, VAN DER PLICHT and MAZAR, 2003a) showing the radiocarbon dating results (BP scale on y-axis) of the various strata on the calibration curve in stratigraphic order to indicate the calibrated range on the historical timescale (x-axis). Notice that the Iron I / Iron II transition occurs between Stratum D-3 and VI, approximately around 980 BCE.

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