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An Earlier Beginning: Radiocarbon Evidence for the Early Bronze Age IA Origin of Jawa (NE-Jordan)

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ABSTRACT

An Earlier Beginning

Radiocarbon Evidence for the Early Bronze Age IA Origin of Jawa (NE-Jordan)

Bernd Müller-Neuhof – Alison Betts – Linda Herveux – George Willcox

Jawa, an Early Bronze Age site in northeastern Jordan, has been the subject of some controversy over the early date assigned to it by its first excavator, Svend Helms, because it represents the apparently precocious appearance of a fortified settlement in the southern Levant. Helms' chronological classification of the first occupation phase at Jawa to the EBA I relied exclusively on pottery typology and was contested due to an apparent contradiction between the "advanced" fortification and hydraulic technologies at Jawa and the early date (mid-4th millennium BCE) of these features. In 2015 the first radiocarbon dates from samples originating from the 1970s excavations at Jawa broadly supported Helms' dating. This paper presents another nine radiocarbon dates from samples also recovered in the 1970s excavations. These have been selected to focus on the fortifications of the Lower Town and show a direct fit of the date of Jawa's establishment with Helms' original dating of EBA IA.

KEYWORDS

EBA I chronology, Eastern Jordan, Jawa, radiocarbon dates

BERND MÜLLER-NEUHOF – ALISON BETTS – LINDA HERVEUX – GEORGE WILLCOX

An Earlier Beginning

Radiocarbon Evidence for the Early Bronze Age IA Origin of Jawa (NE-Jordan)

1 Introduction

1 The prehistoric settlement of Jawa is located in the northwest of the basalt desert (*al-harra*) in northeastern Jordan. This remote site was first recorded in 1931 from the air by the French pilot Antoine Poidebard and excavated by Svend Helms over several seasons from 1972 to 1976.[1] Jawa is particularly characterised by a massive fortification wall encompassing the central part of the settlement, the "Upper Town". Additionally, complex water harvesting systems, consisting of a dam with reservoir, diversion dams, channels, and pools in the nearby Wadi Rajil, and garden terraces with run-off irrigation in its direct vicinity, point to sophisticated strategies in response to the precarious water supply situation during the time that Jawa was populated. The finds from Jawa also included an unusual ceramic repertoire, with parallels both to the southwest in the Jordan valley and the northeast, with distinctive jars reminiscent of the Uruk culture.

2 However, Jawa's most notable feature, when first reported, was the date of the early occupation of the site, particularly in relation to its infrastructure. In his first publication in 1981, and in the absence of ^{14}C analyses, Helms dated the site to "the latter part of the 4th millennium BC"[2], based on comparisons with ceramics from the Jordan Valley ranging from the Late Chalcolithic[3] through Kenyon's Proto-Urban A and B[4] to Early Bronze Age (EBA) I,[5] and Syria.[6] The claim for a southern Levantine 4th millennium site with sophisticated fortifications and elaborate hydro-engineering works was received with scepticism.[7] That Jawa was somewhat peripheral to the southern Levant was not fully considered. Helms was also able to identify a later reoccupation phase,

1 Helms 1981; Betts 1991.
2 Helms 1981, 8.
3 Ghassul: Mallon et al. 1934; Koeppel 1940; Perrot 1955a; Perrot 1955b; Perrot 1955c; Hennessy 1969.
4 Kenyon 1979; Kenyon 1960.
5 Amiran 1969.
6 Hama K: Fugman 1958; Amuq G: Braidwood – Braidwood 1960.
7 E.g., Kempinski 1986; Hanbury-Tenison 1986; Richard 1987.

dating into the EBA IV/MBA I, which is spatially restricted to an area on the summit of the settlement, marked particularly by a large multi-room building.[8]

3 In the mid-1980s, to strengthen his evidence for the 4th-millennium date of the first occupation at Jawa, Helms undertook excavations at Tell Um Hammad in the Jordan Valley,[9] a site where Mellaart[10] had reported seeing examples of the distinctive Jawa impressed ledge handles during his field surveys. Here, ceramics with clear parallels to the Jawa wares were found, neatly stratified in the second phase of Stage 2, reported by Helms as EBA IA.[11] Helms postulated that the ceramics arrived at Tell Um Hammad through a movement down the Wadi Zerqa from the eastern rim of the Jordan Valley. Once again, due to financial constraints, no ^{14}C dates could be processed, but it was now possible to tie down the ceramic chronology much more tightly with that of the southern Levant. Helms' new analysis of the ceramic finds from Jawa, compared with material from Tell Um Hammad and more widely in Palestine and Transjordan, established an EBA I date (mid and second half of the 4th millennium BCE) for the major occupation phase,[12] including the fortification wall and the water harvesting system. Nonetheless, the chronological classification of a site with such an advanced fortification system into the 4th millennium BCE was still a source of doubt among scholars.[13] Until recently, Jawa was therefore viewed as a peculiar, isolated site somewhere in the basalt desert, far away from contemporaneous settlements in the Southern Levant, with whom, however, Jawa amazingly shared similar pottery styles.

4 The peculiarity of the distinctive characteristics of Jawa, such as its isolated location, the advanced fortifications and the complex run-off harvesting systems, has meanwhile been at least partly challenged by the existence of several hillforts in the basalt desert east of Jawa, also characterised by complex run-off harvesting systems, which were identified during the 'Jawa Hinterland Project' in recent years.[14] Additionally, material evidence, and especially radiocarbon dates from these sites, support the chronological classification of this hillfort phenomenon into the Late Chalcolithic/Early Bronze Age I period.[15]

5 It was almost 40 years after the excavations at Jawa that it became possible to publish the first radiocarbon dates from Jawa.[16] It was a great fortune that organic samples, specifically carbonised plant remains from the 1970s excavations, had been stored in the laboratories at the Maison de l'Orient in Lyon. Five samples (J1 to J5), originating from the earliest levels from four excavation areas (see Fig. 1), were first analysed at the Center for Applied Isotope Studies in Athens (Georgia, USA) to define a timespan within which the foundation of Jawa can be dated.[17] Based on consideration of date ranges for the samples, the authors concluded that the phase of the earliest occupation at Jawa started between 3,500 and 3,400 calBC, corresponding to the EBA IB in currently proposed chronological divisions for the southern Levant.[18]

6 Given the importance of the site, with the desire to obtain a deeper understanding of the Jawa chronology and thanks to a generous contribution from the University of Sydney,[19] another nine samples were sent for radiocarbon dating in 2020.

8 Helms 1989.
9 Betts 1992.
10 Mellaart 1962.
11 Cf. Betts 1992, fig. 197:4.
12 Betts 1992; Helms 1991b, 71–73.
13 See Helms 1991a, 9–10; de Miroschedji 1994, 136; Regev et al. 2012.
14 Müller-Neuhof 2017; Müller-Neuhof 2020.
15 Müller-Neuhof – Abu-Azizeh 2016a.
16 Müller-Neuhof et al. 2015.
17 Müller-Neuhof et al. 2015.
18 Regev et al. 2012.
19 Funds provided from the Edwin Cuthbert Hall Bequest, University of Sydney.

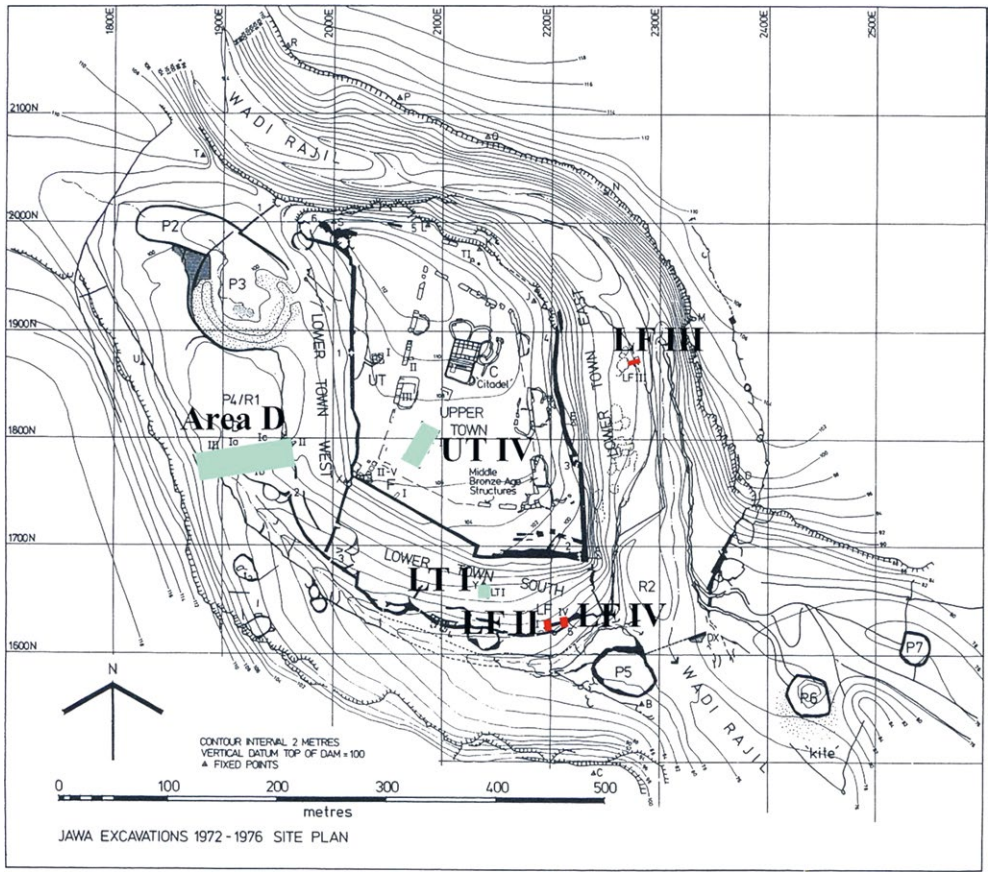

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Fig. 1: Plan of Jawa (Helms 1981, Fig. 13) with localisation of the areas from which the first dated samples originate (blue) (Müller-Neuhof et al. 2015) and the areas from which the samples dated this time originate (red)

الشكل ١: مخطط جاوه (عن الشكل Helms 1981, Fig. 13) مع تحديد مواقع المناطق التي أُخذت منها العينات الأولى المؤرخة (الأزرق) (Müller-Neuhof et al. 2015) ومواقع المناطق التي أُخذت منها العينات هذه المرة (الأحمر)

These samples, all derived from the fortifications of the "Lower Town" and the "Lower Fortification", have been dated at the Radiocarbon Laboratory in Poznań. Continuing the designation of the first five radiocarbon dates from Jawa (J-1 to J-5), we labelled the new dates J-6 to J-14.

2 Sample selection

7 The nine samples were selected according to their stratigraphic significance from charred remains recovered by dry hand-sieving for archaeobotanical analyses during the 1970 season (see Tab. 1 Suppl. online material published here for the first time. The data is accessible as a .xlsx-table via iDAI.repo (https://doi.org/10.34780/ofknfr29)). The charred remains were dominated by cultivated barley and emmer wheat, cultivated lentils, pea and chickpea. Identification of charcoal fragments indicated an environment dominated by deciduous oak, almond and oriental terebinth (*Pistacia*) (Tab. 1 Suppl.). These plants cannot survive today in the arid environment where Jawa is situated, which implies the possibility of a moister climate during the Early Bronze Age and/or some kind of water management, as is indicated by the EBA I garden terraces with sophisticated run-off irrigation in the direct vicinity of Jawa.[20]

8 The samples for ^{14}C were obtained from *loci* on floors, below walls, on basalt bedrock or in ash layers or ash lenses. Due to the fact that the majority of samples from the 1970s excavations were taken from excavation areas in the lower settlement of Jawa, the selected samples and their radiocarbon dates represent only areas of the lower settlement, especially the lower fortification areas LF 2, LF 3 and LF 4.

20 Müller-Neuhof 2012; Müller-Neuhof 2014.

Sample No.	Area / Locus No.	Sample Context
J-6	LF 2d 810.5	Lower fortification, trench LF 2d: ashy deposits (?) between LW5 and remains of house wall on bedrock. Sample from clay floor between two layers of occupational debris.
J-7	LF 2d 810.12	Lower fortification, trench LF 2d: ashy deposits (?) between LW5 and remains of house wall on bedrock. Sample from clay floor between two layers of occupational debris.
J-8	LF 2a 805.32	Lower fortification, trench LF 2a: below younger wall LW4, lowest locus. Hearth on bedrock (basalt), filled with grey/black ash, sealed by a hard clay 'floor' surface.
J-9	LF 3a 1402.4	Lower fortification, trench LF 3a/b: contemporary to inner fortification (BA) and corral structure (CA). Undistinguished grey topsoil below corral wall. Locus contained material from the 4th millennium BCE mixed with Late Antique material (c. 5th–6th cent. CE).
J-10	LF 3a 1402.5	Lower fortification, trench LF 3a/b: contemporary to inner fortification (BA) and corral structure (CA). Undistinguished grey topsoil below corral wall. Locus contained material from the 4th millennium BCE mixed with Late Antique material (c. 5th–6th cent. CE).
J-11	LF 3a 1402.3	Lower fortification, trench LF 3a/b: contemporary to inner fortification (BA) and corral structure (CA). Undistinguished grey topsoil below corral wall. Locus contained material from the 4th millennium BCE mixed with Late Antique material (c. 5th–6th cent. CE).
J-12	LF 3a 1402.7	Lower fortification, trench LF 3a/b: earliest occupation layer on virgin soil, older than inner fortification (BA) (4th millennium). Soft brown soil on virgin soil against a wall fragment.
J-13	LF 4a 1500.10	Lower fortification, trench LF 4a: floor and occupation layer contemporary to house wall (BA) and LW5. Sample from clay floor between two layers of occupational debris.
J-14	LF 4a 1500.16	Lower fortification, trench LF 4a: contemporary to LW5, below house wall (BA).

Fig. 2: Table with stratigraphic location of the analysed ^{14}C samples

الشكل ٢: جدول يبين مواضع أخذ عينات الكربون١٤ المحللة ضمن التعاقب الطبقي

2

9 Additionally, sample reliability determined the sample selection. Samples with any risk of contamination had to be excluded and possible "old wood" effects had to be avoided. Absence of the latter, however, cannot fully be guaranteed, due to the fact that a number of samples were charcoals from possibly mature oak and terebinth trees. The tables in Fig. 2 and Fig. 3 summarise the stratigraphic location and content of the samples.[21]

2.1 Sample preparation and process

10 The analyses were carried out by the Poznań Radiocarbon Laboratory under the direction of Tomasz Goslar. The following description of the procedures of AMS ^{14}C dating used by the laboratory is an extract from the document on the procedure description, which can be found on the website of the Poznań Radiocarbon Laboratory.[22] Methods of chemical pre-treatment generally follow those used in the Oxford Radiocarbon Accelerator Unit, as described by Brock et al. 2010.

11 Samples of charcoal and wood are treated with 1 M HCl (80 °C, 20+ min), 0.025-0.2 M NaOH (room temperature for fragile plant remains, 80 °C for wood) and then 0.25 M HCl (80 °C, 1 hour). After treatment with each reagent, the samples are

21 We are grateful to Reinder Neef (German Archaeological Institute) for his sample evaluation and identification of plant species prior to the submission of the samples to the radiocarbon laboratory.

22 https://radiocarbon.pl/en/sample-preparation/.

Sample No.	Area / Locus No.	Sample Content and Quality
J-6	LF 2 810.5	Seeds: Cereals (*Triticum diccocon*, *Hordeum vulgare*), Pulses (*Lens culinaris*). No contamination.
J-7	LF 2 810.12	Seeds: Cereals (*Triticum diccocon*, *Hordeum vulgare*), Pulses (*Cicer arietinum*), Weed (*Galium* spp.). No contamination.
J-8	LF 2 805.32	Wood (Charcoal): *Crataegus/Pyrus*, Amaranthaceae. No contamination.
J-9	LF 3 1402.4	Wood (Charcoal): *Quercus* spp., *Pistacia* spp., *Prunus amygdalus*, *Crataegus/Pyrus*, *Olea* spp., *Fraxinus* spp. No contamination.
J-10	LF 3 1402.5	Wood (Charcoal): *Quercus* spp., *Tamarix* spp. No contamination.
J-11	LF 3 1402.3	Wood (Charcoal): *Quercus* spp. No contamination.
J-12	LF 3 1402.7	Wood (Charcoal): *Prunus amygdalus*. No contamination.
J-13	LF 4 1500.10	Wood (Charcoal): *Crataegus/Pyrus*, Amaranthaceae. No contamination.
J-14	LF 4 1500.16	Wood (Charcoal): *Quercus* spp., *Pistacia* spp. No contamination.

Fig. 3: Table showing the content and quality of the ^{14}C samples

الشكل ٣: جدول يُظهر محتوى ونوعية عينات الكربون[٤]

3

rinsed with deionised water (Millipore) until pH=7. For the first HCl treatment, longer time (20+ min) is applied, if emanation of gas bubbles from the sample is still visible. The step of NaOH treatment is repeated a few times, generally until no more coloration of the NaOH solution appears, but the NaOH treatment is interrupted if there is a danger of complete dissolution of the sample.

12 In case of organic samples, CO_2 is produced by combusting the sample in closed (sealed under vacuum) quartz tubes, together with CuO and Ag wool, at 900 °C over 10 hours. CO_2 from carbonate samples is leached by treating with concentrated ortho-phosphoric acid (H_3PO_4) in a vacuum line.

13 The obtained gas (CO_2 + water vapour) is then dried in a vacuum line, and reduced with hydrogen (H_2), using 2 mg of Fe powder as a catalyst. The obtained mixture of carbon and iron is then pressed into special aluminium holder, according to the description provided by Czernik and Goslar.[23]

14 Content of ^{14}C in a sample of carbon is measured using the spectrometer "Compact Carbon AMS" (manufacturer: National Electrostatics Corporation, USA) described in the paper from Goslar et al. (2004). The measurement is performed by comparing intensities of ionic beams of ^{14}C, ^{13}C and ^{12}C measured for each sample and for standard samples (modern standard: "Oxalic Acid II" and standard of ^{14}C-free carbon: "background"). In each AMS run, 30–33 samples of unknown age are measured, alternated with measurements of 3–4 samples of modern standard and 1–2 samples of background. In case, where organic samples are dated, the background is represented by coal, while in case of carbonate samples, the background is represented by the sample IAEA C1.

15 Conventional ^{14}C age is calculated using correction for isotopic fractionation,[24] basing on ratio $^{13}C/^{12}C$ measured in the AMS spectrometer simultaneously with the ratio $^{14}C/^{12}C$. Uncertainty of calculated ^{14}C age is determined using uncertainty implied from counting statistics, and also spread (standard deviation) of partial $^{14}C/^{12}C$ results, whichever is bigger. Uncertainties of $^{14}C/^{12}C$ ratios measured on standard samples are additionally taken into account. The 1-sigma uncertainty of conventional ^{14}C age given in our reports is the best estimate of the total uncertainty of measurement.

23 Czernik – Goslar 2001.

24 See Stuiver – Polach 1977.

Lab.-No.	Sample-ID	^{14}C age years BP	±
Poz-131184	J-6	4690	40
Poz-130654	J-7	4710	40
Poz-130655	J-8	4720	40
Poz-130657	J-9	4480	40
Poz-130869	J-10	4635	35
Poz-130870	J-11	4670	35
Poz-130865	J-12	4685	35
Poz-130871	J-13	4595	35
Poz-130733	J-14	4795	30

Fig. 4: Table with uncalibrated AMS dates from Jawa

الشكل ٤: جدول يتضمن تواريخ غير معايرة من جاوه اكتسبت بتقنية ‹مُعجِّل مطياف الكتلة›

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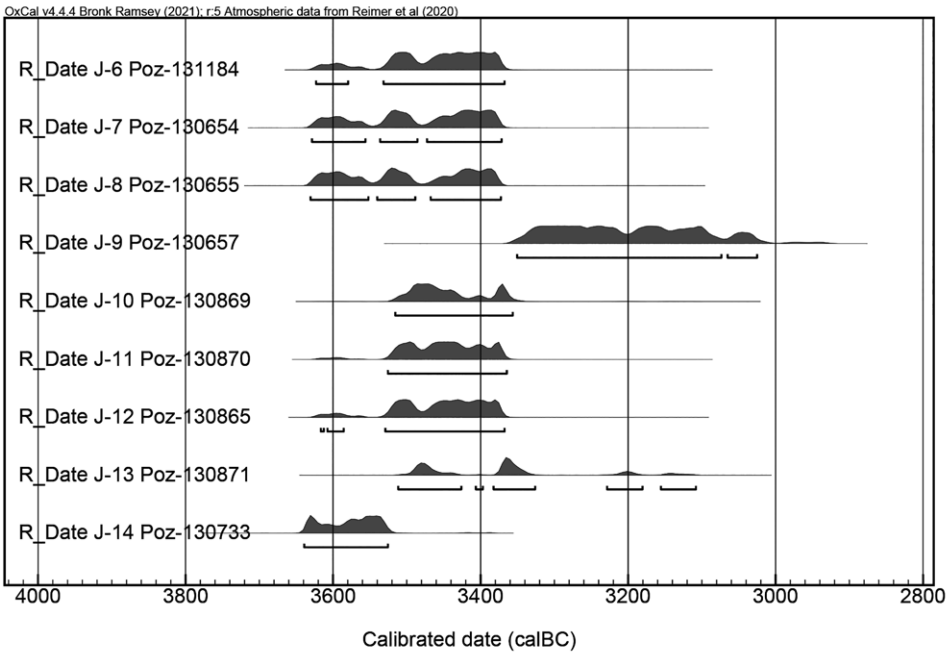


Fig. 5: Chart with calibrated dates J-6–J-14 from Jawa

الشكل ٥: رسم بياني يتضمن التواريخ المعايرة J-6–J-14 من جاوه

5

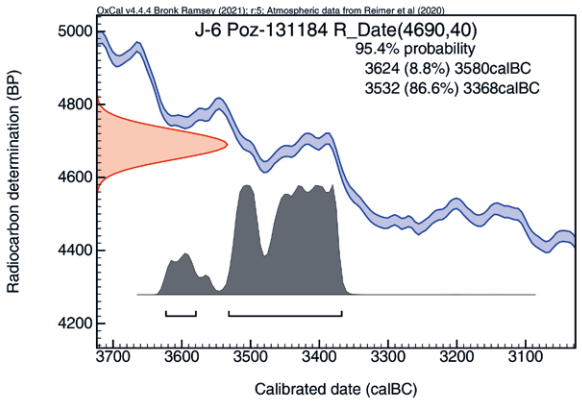
16 Calibration of ^{14}C age is performed using the program OxCal ver. 4.4 (2023),[25] based on Bronk Ramsey (2001). Calibration is performed against the newest version of the ^{14}C calibration curve, i.e. INTCAL13.[26] For the present study, we have chosen the 95,4 % confidence interval of the calibrated range.

3 Dating results

17 The results of the radiocarbon dating are presented with the uncalibrated dates in Fig. 4. A chart with the calibrated dates is represented in Fig. 5 and the charts of the single calibrated dates are represented in Figs. 6. 7. 8. 9. 10. 11. 12. 13. 14. As mentioned above, the fortification in the Lower Town South was archaeologically explored in areas: Lower Fortification 2 (LF 2) and Lower Fortification 4 (LF 4).

25 Bronk Ramsey 2009.

26 Reimer et al. 2013.



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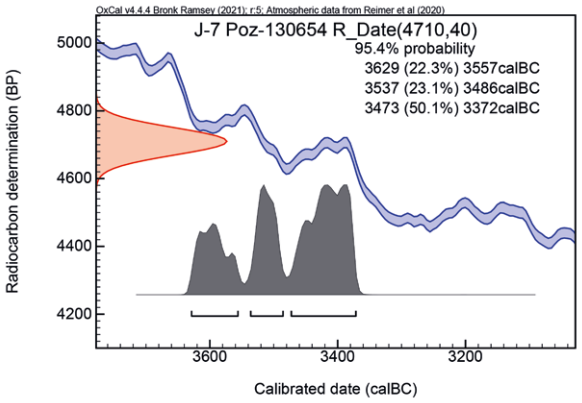

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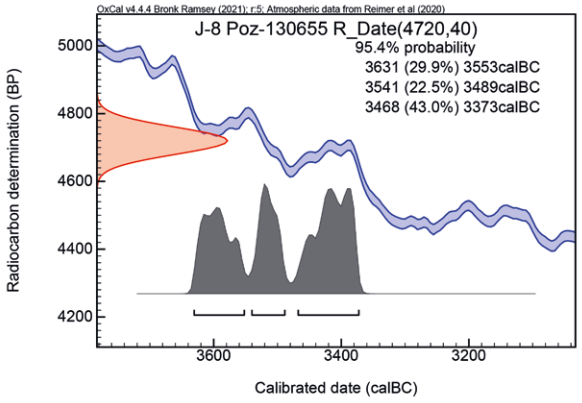

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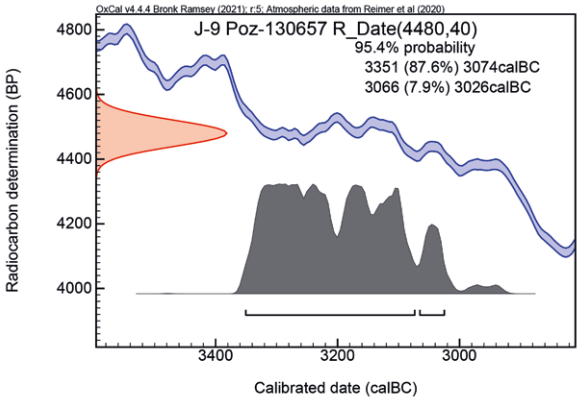

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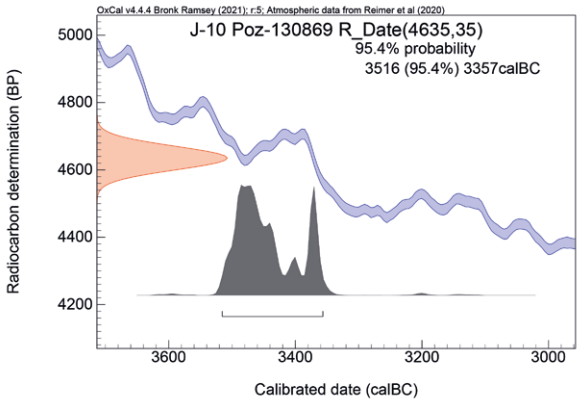

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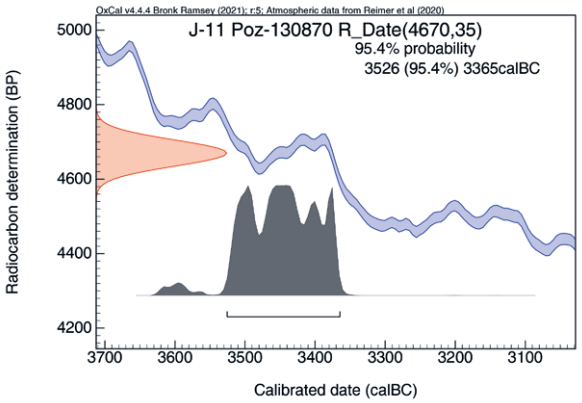

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Fig. 6: Chart of the calibrated date from sample J-6

الشكل ٦: رسم بياني للتاريخ المعاير من العينة J-6

Fig. 7: Chart of the calibrated date from sample J-7

الشكل ٧: رسم بياني للتاريخ المعاير من العينة J-7

Fig. 8: Chart of the calibrated date from sample J-8

الشكل ٨: رسم بياني للتاريخ المعاير من العينة J-8

Fig. 9: Chart of the calibrated date from sample J-9

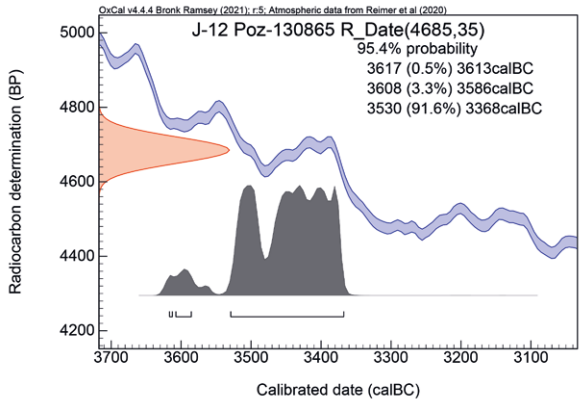
الشكل ٩: رسم بياني للتاريخ المعاير من العينة J-9

Fig. 10: Chart of the calibrated date from sample J-10

الشكل ١٠: رسم بياني للتاريخ المعاير من العينة J-10

Fig. 11: Chart of the calibrated date from sample J-11

الشكل ١١: رسم بياني للتاريخ المعاير من العينة J-11



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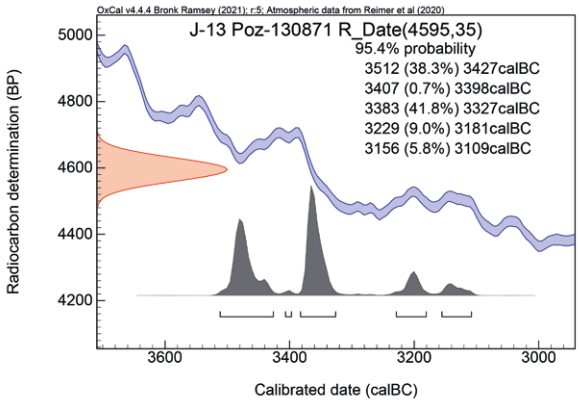

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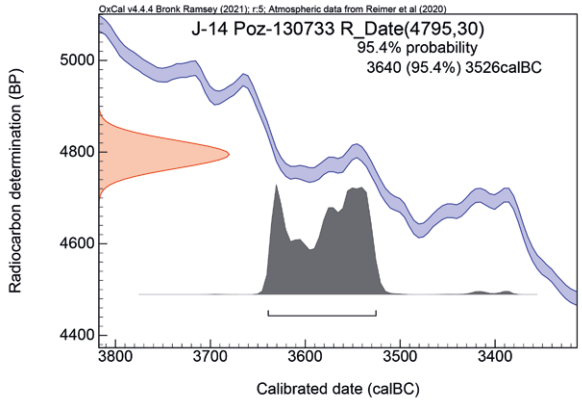

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Fig. 12: Chart of the calibrated date from sample J-12

الشكل ١٢: رسم بياني للتاريخ المعاير من العينة J-12

Fig. 13: Chart of the calibrated date from sample J-13

الشكل ١٣: رسم بياني للتاريخ المعاير من العينة J-13

Fig. 14: Chart of the calibrated date from sample J-14

الشكل ١٤: رسم بياني للتاريخ المعاير من العينة J-14

LF 2

18 From the area LF 2 we have a cluster of three dates (J-6, J-7 and J-8) from two trenches (LF 2a and LF 2d). Samples J-6 and J-7 derive from trench LF 2d. The chronological sequence of sample J-6 dates between 3,532 and 3,368 calBCE. The dates of sample J-7 are a bit blurred and cover a sequence between 3,629 and 3,372 calBCE. A comparable chronological range can be observed in the dates from sample J-8, which was taken in trench LF 2a and shows a chronological sequence between 3,631 and 3,373 calBCE (Figs. 6. 7. 8).

19 The earlier occupation activities in the LF 2 area, where the three samples derive from, are characterised by the remains of a wall of a dwelling structure in the north, remnants of a first inner defence wall (LW5) and remains of an outer fortification wall (LW4), which was constructed later and a few meters towards the south.[27] The samples J-6 and J-7 from trench LF 2d are from upper levels and have been taken from strata characterised by clay floors, which were located between the wall of a dwelling structure and the inner (and earlier) fortification wall LW5. Sample J-8 comes from the trench LF 2a and was taken from the lowest locus in the LF 2 area, an ashy fill of a hearth, which was placed on the basalt rock and sealed by a layer of clay. This findspot is located between the older fortification wall LW5 and the younger outer fortification wall LW4 and stratigraphically below the foot of LW4. The contemporaneity of these dates, especially between the trenches LF 2a and LF 2d, show that the area outside of LW5 was already occupied or at least used, before LW4 was constructed. The date of sample J-8 therefore, is a *terminus ante quem* for the construction of LW4.

LF 4

20 The other section of the fortification of the Lower Town South excavated is area LF 4, some meters east of LF 2. It can be linked to LF 2, since both the inner and outer fortification walls (LW5 and LW4) were traced through.[28] Two samples (J-13 and J-14) have been taken from two different locations and strata in trench LF 4a.

21 The sample J-13 dates between 3,512 and 3,327 calBCE, but the slightly higher probability can be reduced to a sequence between 3,383 and 3,327 calBCE (Figs. 9. 10).

27 Helms 1991c, 44.

28 Helms 1991c, 43.

The locus where the sample derives from lay in the uppermost clay floor of a sequence of floors and occupation deposits between the inner face of LW5 and a house wall (BA). This area was identified as a possible narrow doorway.[29] The stratum of the sample may correspond with the phase when the fortification wall LW5 went out of use and the new wall LW4 was built.[30]

22 Consequently, the sample J-14, which comes stratigraphically from a deep locus in the lower fortification areas LF 2 and LF 4, is of an older date and dates between 3,640 and 3,526 calBCE. It was collected in the occupation debris below house wall BA close to the foot of wall LW5, which was built directly on bedrock. This date overlaps with the beginning of the chronological sequence of the samples J-6 to J-8. The fortification in Lower Town East was explored in the Lower Fortification 3 (LF 3) area.

LF 3

23 The trench LF 3a in the fortification area of the Lower Town East was excavated to date the corral walls (CA) behind the inner fortification wall (BA). Three samples (J-9, J-10 and J-11) derive from undistinguished grey topsoil, in which the corral walls were set and which also abutted the upper parts of the inner fortification wall (BA).[31] Sample J-9 dates between 3,351 and 3,074 calBCE, the sequence of dates of sample J-10 is between 3,516 and 3,357 calBCE and the dates of sample J-11 are 3,526 and 3,365 calBCE (Figs. 11. 12. 13).

24 While the date for J-9 is younger than the two other dates, it might refer to the construction of the corral at a later date, after the inner fortification wall went out of use. However, an assemblage of mixed pottery dating into the 4th millennium and into Late Antiquity found in the layer where the sample was collected,[32] could even refer to a much later date of construction, indicating a disturbed layer, which renders the reliability of the stratigraphic location of the sample and therefore the date of the layer doubtful.

25 The other two dates (J-10 and J-11) are also from the same layer, but they are congruent to the date of the sample J-4 from locus LF 3a 1402.6[33] from the same trench, which was already radiocarbon dated in 2015 (UGAMS 20570: 3,500–3,350 calBCE)[34] and shows a stronger reference to the general chronological sequence of the EBA occupation. All three samples (J-4, J-10 and J-11) more or less date into the same sequence observed in areas LF 2 and LF 4 and suggest a general contemporaneity of the lower fortifications south and east.

26 This assumption is further supported by the date of sample J-12, which is a little bit older than sample J-10 and J-11 and dates between 3,530 and 3,368 calBCE (Fig. 14). It was taken from the traces of the earliest occupation in this area on virgin soil in contact with wall AA, which probably belonged to an older fortification wall part of the outer defensive line.[35] Due to the fact that this stratigraphic location was most likely undisturbed it can be regarded as reliable.

29 Helms 1991c, 43.

30 Helms 1991c, 43.

31 Helms 1991c, 44.

32 See Helms 1991c, 44–45.

33 Please note the scribal error in the right column of table 1 in the Müller-Neuhof et al. 2015 paper. The designation of the square is LF 3 not LF 2.

34 Müller-Neuhof et al. 2015, 129.

35 Helms 1991c, 45.

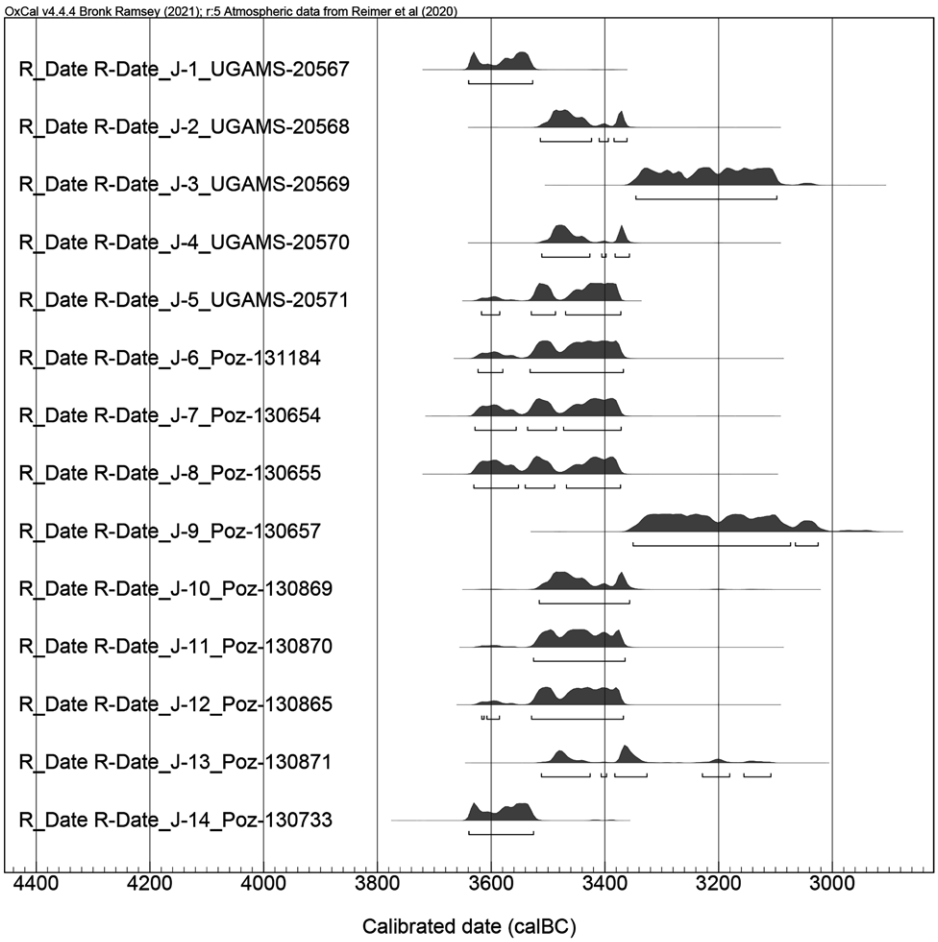

Fig. 15: Chart with all calibrated dates from Jawa (samples J-1–J-14)

الشكل ١٥: رسم بياني يحتوي كافة التواريخ المعايرة من جاوه (العينات J-1–J-14)

15

4 Discussion

27 When we join the present chronological sequence of Jawa with the sequence of the first five radiocarbon dates (J-1 to J-5)[36] we notice that the majority of radiocarbon dates range between c. 3,640 and 3,350 calBCE, irrespective of the localisation of the dated samples (Fig. 15). Albeit the majority of dates are from the Lower Town South and East, the single date from a room in the Upper Town (J-5) fits well into the sequence of dates from the fortifications in Lower Town South. Interestingly the earliest date of the dam (J-1) 3,650–3,520 calBCE seems to be slightly earlier than the beginning of the fortification in Lower Town South and suggests that the construction of such a hydraulic structure was a precondition for any further construction activities at this site. Additionally, our critique on the reliability of this early date[37] in comparison to the second date of the dam (J-2) from a nearby locus in the stratigraphy of the dam (3,520–3,350 calBCE), which was explained by a possible “old wood effect”, might be wrong, due to the large number of radiocarbon dates from further samples, especially from the fortifications in the Lower Town South (LF 2 and 4), where sequences start around 3,640 calBCE.

28 However, when we compare the sequences of the fortifications in Lower Town South with the sequence of the fortifications in Lower Town East it seems that there is a slight chronological disparity in the beginning of the sequences between these two areas. It seems that the occupation and respective construction activities started slightly later in the fortification area of Lower Town East (around 3,520 calBCE) than in

36 Müller-Neuhof et al. 2015.

37 See Müller-Neuhof et al. 2015, 129–130.

the fortification area of Lower Town South (around 3,640 calBCE). Interestingly, both sequences ceased almost simultaneously around 3,380 calBCE. However, this assumption has to be taken with some caution, as the samples, taken from the lowest occupation activity layers (e.g. on the basalt rock, on virgin soil or sterile layer) such as J-8, J-12 and J-14, were all sampled from areas which are located outside the first, and hence older, fortification wall. Their dates can therefore only be regarded as a *terminus ante quem* for construction of the second fortification walls in Lower Town South and Lower Town East. The contemporaneity of some of these sample dates with the dates of their immediate adjacent samples (J-8 to J-6 and J-7; J-12 to J-10 and J-11), which are from higher occupation strata behind the older fortification walls, simply indicates that the older fortification wall, and thus occupation activities behind the old wall, existed for a longer period before the new fortification wall was constructed.

29 Due to this observation, we may conclude that the initial settlement, at least in the lower town areas, started earlier than 3,640 calBCE. That means that we have to revise our initial assumption that the settlement activities at Jawa started in the EBA IB period[38] and have rather to suggest an earlier date, probably sometime before 3,600 calBCE. This would place the first settlement of Jawa into the EBA IA or better into the transition period between EBA IA (3,700–3,400) and EBA IB (3,400–3,100) according to the EBA I chronology of the Southern Levant.[39] This assumption fits very well with the observations made in the Jordan Valley, such as Shuna, where the EBA IA starts sometime between 3,700 and 3,600 calBCE[40] and the beginning of the EBA IB starts between 3,400 and 3,300 calBCE.[41]

30 When we integrate this sequence into the chronology of Syria, where the 4th millennium belongs to the Late Chalcolithic (LC) period, the radiocarbon dated sequence of the occupations at Jawa covers the period LC 4 (3,600–3,400 calBCE) and the beginning of LC 5 (3,400–3,000 calBCE). Additionally, we have evidence for pottery finds from Jawa showing parallels with Uruk pottery.[42] There is also the Uruk jar discovered at the hillfort site Tulul al-Ghusayn, east of Jawa, which originally derives from the Euphrates region. Its find context was radiocarbon dated between 3761 and 3523 calBCE,[43] therefore covering the Middle Uruk period.[44] Thus, it is appropriate to take a wider view of Jawa's chronology and to integrate the current chronological sequence of EBA I Jawa into the Uruk chronology. This integration shows again[45] that the hitherto dated construction and occupation activities at Jawa are congruent with the Middle Uruk period (3,800–3,350 BCE), a consideration that may help to explain the early appearance of well-developed fortifications so early in northeast Jordan.

5 Conclusion

31 The new radiocarbon dates from Jawa support the previous dating of the early construction and occupation activities to EBA I, as already stated by Helms[46] and by the first radiocarbon dates from Jawa published by Müller-Neuhof et al.[47] Contrary to

38 Müller-Neuhof et al. 2015, 129–130.
39 Milevski et al. 2022, table 1.
40 Bourke et al. 2009, 910 quoting Philip 2008, 166–168.
41 Bourke 2000, 252; Bourke et al. 2009, 909.
42 Helms 1991b, 91. 96–99.
43 Müller-Neuhof – Abu-Azizeh 2016a; Müller-Neuhof – Abu-Azizeh 2016b.
44 Müller-Neuhof 2021.
45 See Müller-Neuhof 2021, 305–306.
46 Helms 1991b.
47 Müller-Neuhof et al. 2015.

our previous suggestion that the early occupation activities at Jawa should be dated to the EBA IB,[48] we have now a more robust chronological classification of these activities, suggesting a start in the EBA IA rather than in the EBA IB.

32 However, we have no dates yet from the beginning of the construction activities at Jawa except for the dam. Additionally, the majority of dated samples originate from the fortification areas in the Lower Town South and the Lower Town East. For the fortification of the central occupation (Upper Town) as well as the settlement in the Upper Town, with the exception of one date from a building in this area (sample J-5),[49] we have no dates yet, and unfortunately no useful samples were collected from these areas in the 1970s excavations. However, strata with abundant ash and charcoal concentrations visible in the sections of recent looting pits in the Upper Town indicate good future possibilities for expanding the radiocarbon chronology of Jawa including the Upper Town area and probably also for extending the chronological sequence of the EBA I occupation at Jawa back to the actual origin somewhere at the beginning of the Early Bronze Age IA.

Supplement

33 The Table gives the results of identifications obtained from the charred remains from the 1970 season at Jawa. The ^{14}C samples were selected from them. Only dry sieving (as opposed to flotation) was possible due to lack of water during the excavation. Charred remains were hand-picked from the sieved material which inevitably resulted in a limited data set. Despite this, the results demonstrate that a typical assemblage of cultivated cereals and pulses were in use at Jawa during the Early Bronze Age. Fuel was obtained from forest species which today grow on the western slopes of the Jebel Druze between 1100 and 1500 m a.s.l. situated between 40 and 50 km northwest of Jawa. During the Early Bronze Age these trees may have been growing further east and would have been nearer the site.

Authors contributions

34 Bernd Müller-Neuhof: investigation, writing original draft, writing review and editing
Alison Betts: funding acquisition, writing review and editing
George Willcox: investigation, identification, resources, sample handling, data curation
Linda Herveux: investigation, identification, resources, sample handling, data curation

48 Müller-Neuhof et al. 2015.
49 Müller-Neuhof et al. 2015.

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ZUSAMMENFASSUNG

Ein früherer Anfang

Radiokarbondaten belegen den Ursprung Jawas (NO-Jordanien) in der Frühen Bronzezeit IA

Bernd Müller-Neuhof – Alison Betts – Linda Herveux – George Willcox

Jawa ist ein frühbronzezeitlicher Fundort im Nordosten Jordaniens, dessen frühe Datierung durch den ersten Ausgräber Svend Helms Kontroversen auslöste, weil sie das scheinbar frühe Auftreten einer befestigten Siedlung in der südlichen Levante darstellt. Helms' chronologische Einordnung der ersten Besiedlungsphase von Jawa in die FBZ I stützte sich ausschließlich auf die Keramiktypologie und wurde aufgrund eines offensichtlichen Widerspruchs zwischen den „fortschrittlichen" Befestigungs- und Wasserbautechnologien in Jawa und der frühen Datierung (Mitte des 4. Jahrtausends v. Chr.) dieser Merkmale angefochten. Im Jahr 2015 stützten die ersten Radiokarbondaten von Proben aus den Ausgrabungen der 1970er Jahre in Jawa weitgehend Helms' Datierung. In diesem Beitrag werden neun weitere Radiokarbondaten präsentiert, die ebenfalls von Proben aus den Ausgrabungen der 1970er Jahre stammen. Diese wurden ausgewählt, um sich auf die Befestigungsanlagen der Unterstadt zu konzentrieren und sie zeigen eine direkte Übereinstimmung des Datums der Gründung von Jawa mit Helms' ursprünglicher Datierung in die FBZ IA.

SCHLAGWORTE

Frühe Bronzezeit I-Chronologie, Ostjordanien, Jawa, Radiokarbondaten

الخلاصة

بداية أبكر. دليل الكربون المشع لظهور جاوه في العصر البرونزي المبكر IA (شمال شرقي الأردن)

بِرْند مُللر-نوبْهوف – أَلِسُن بِتْس – لِندا إيرڤـو – جورج وِلكوكس

جاوه موقع أثري في شمال شرقي الأردن يعود إلى العصر البرونزي المبكر، وقد أثار تأريخه المبكر من قبل منقبه الأول سْـڤِـنْد هِلْمس الكثير من الجدل، وهذا لأنه يمثل على ما يبدو ظهورًا مبكرًا لمستوطنة محصنة في جنوب شرقي البحر الأبيض المتوسط. وقد اعتمد إرجاع هِلْمس لمرحلة الاستيطان الأولى في جاوه ضمن الترتيب الزمني إلى العصر البرونزي المبكر I على نماذج الفخار حصريًا وشُكِّك فيها بسبب التناقض الواضح بين التحصينات «المتطورة» والتقنيات المائية في جاوه والتأريخ المبكر (منتصف الألف الرابع ق.م) لهذه المعالم. إلا أن تواريخ الكربون المشع الأولى لعينات نجمت عن تنقيبات سبعينات القرن الماضي في جاوه دعمت عام ٢٠١٥ تأريخ هِلْمس بصفة عامة. يقدم هذا المقال تسعة تواريخ أخرى بالكربون المشع نتجت أيضًا عن عينات من تنقيبات سبعينات القرن الماضي. وقد اختيرت هذه بغرض التركيز على منشآت التحصين في المدينة السفلى وتُظهر توافقًا مباشرًا بين تاريخ تأسيس جاوه والتأريخ الأصلي لهِلْمس إلى عصر البرونز المبكر IA.

الكلمات المفتاحية

التعاقب الزمني للعصر البرونزي المبكر I، شرقي الأردن، جاوه، بيانات الكربون المشع

FIGURE CREDITS

Frontispiece: View of Gate 4 in the lower town south fortification LF 2 with the fortification wall of the upper town in the background, © B. Müller-Neuhof, VAM-Jawa Project
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