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Radiocarbon Evidence from Tell Abu en-Ni'aj and Tell el-Hayyat, Jordan, and Its Implications for Bronze Age Levantine and Egyptian Chronologies

Steven E. Falconer
University of North Carolina Charlotte

Patricia L. Fall
University of North Carolina Charlotte

Abstract
Archaeological interpretation of the Levantine Bronze Age depends on a regional chronology based on material culture and settlement dynamics with presumed linkages to Egyptian political history. We discuss current radiocarbon sequences from Tell Abu en-Ni'aj and Tell el-Hayyat in the northern Jordan Valley, Jordan that expand the traditional time range of the Early Bronze IV Period, contract the range of the Middle Bronze Age, and thereby call into question the chronological correlations and explanatory value of previously assumed linkages to the dynastic history of Egypt.

Introduction
The Bronze Age of the Southern Levant witnessed the advent, abandonment and redevelopment of fortified towns over the course of the fourth through second millennia BCE. The chronology and periodization of the Southern Levantine Bronze Age have been derived traditionally from changes in Levantine material culture and settlement patterns, and from their presumed associations with Egyptian dynastic history.[1] An era of walled communities in Early Bronze II–III[2] was followed by more dispersed settlement in farming hamlets and pastoral encampments during Early Bronze IV (also known as the Intermediate Bronze Age or Intermediate EB–MB).[3] During the early second millennium BCE larger fortified towns redeveloped rapidly in Middle Bronze I (previously termed Middle Bronze IIA) and subsequently proliferated in Middle Bronze II and III (previously Middle Bronze IIB and C).[4] The Late Bronze Age experienced intensified commercial and political interaction throughout the Eastern Mediterranean in the late second millennium BCE,[5] including the first documentation of Levantine polities.[6]

The relative chronology of the Levantine Bronze Age stems largely from stylistic changes in pottery morphology, especially following the introduction of the fast kick wheel early in the Middle Bronze Age, and from parallels in ceramics and metals with Syria and Lebanon.[7] On the other hand, the traditional absolute chronology of the constituent periods within the Bronze Age depends on linkages with the dynastic sequences of Egypt. Three socio-political correlations have been particularly influential in framing the Early Bronze IV and Middle Bronze Age chronologies of the Southern Levant. First, Levantine Early Bronze IV town abandonment has been linked with the political collapse of Egypt's First Intermediate Period, ca. 2300/2200–2000 BCE.[8] Second, the resurgence of Levantine town life at the beginning of the Middle Bronze Age has been dated and explained as a response to the reestablishment of Egyptian political cohesion marked by the ascension of the 12th Dynasty ca. 2000 BCE.[9] Third, the duration of Middle Bronze III often is equated to the era of Hyksos rule in Egypt, with its end therefore ascribed to the Hyksos "expulsion" ca. 1550/1500 BCE.[10] However convenient these correlations may appear, the contemporaneity and therefore the explanatory

relationship of each of these linkages should now be reviewed on the basis of independent chronometric evidence from the Southern Levant. This study presents a sequence of new accelerator mass spectrometry (AMS) ^{14}C ages from Tell el-Hayyat, Jordan, which suggests a shortened timespan for the Middle Bronze Age in the Jordan Valley, beginning ca. 1900 cal BCE and ending ca. 1650 cal BCE. In conjunction with a recently published AMS sequence from nearby Early Bronze IV Tell Abu en-Ni'aj[11] we reexamine Bronze Age chronology in the Southern Levant, and its assumed temporal and explanatory linkages with Egypt.

Levantine Chronology

Over the last several years the Levantine Early Bronze Age has undergone a comprehensive chronometric revision. Bayesian modeling of ^{14}C ages from sites across the Northern and Southern Levant stretch Early Bronze I-IV from the early fourth millennium to about 2000 cal BCE.[12] This revision shifts the beginning of the Early Bronze Age and the transitions between its constituent sub periods significantly earlier than traditional chronologies. For example, the Early Bronze III/IV transition is repositioned no later than about 2450 cal BCE.[13] Comparative analysis of ^{14}C ages from Middle Bronze sites likewise revises the Early Bronze/Middle Bronze interface slightly later than the traditional date of about 2000 BCE.[14] Redefinition of this juncture suffers from a paucity of settlements stratified through Early Bronze IV or across the Early Bronze IV/Middle Bronze transition. Two excavated settlements in the northern Jordan Valley, Tell Abu en-Ni'aj and Tell el-Hayyat, provide stratified AMS sequences that span Early Bronze IV and the Middle Bronze Age, contributing independent evidence for further revisions to Levantine Bronze Age chronology and its implied links with Egypt.

Tell Abu En-Ni'aj

Tell Abu en-Ni'aj represents an agrarian community of about 500–600 inhabitants at about 250 m below sea level overlooking the modern floodplain of the

Figure 1: Map of the Eastern Mediterranean showing Early Bronze IV and Middle Bronze Age sites in the Northern and Southern Levant discussed in this study.

Jordan River (Fig. 1).[15] Excavation over nearly 800 m^2 reveals seven stratified phases of mud brick village architecture up to 3.3 m deep.[16] Phase 7 structures are built directly on archaeologically sterile sediments, while Phase 1 remains lie just below the tell's modern surface. The pottery excavated at Abu en-Ni'aj consists entirely of fine-grained hand-built forms that characterize Early Bronze IV ceramics, in particular accordance with Dever's Family NC.[17] The pottery from the lower phases lacks some features attributed to the beginning of Early Bronze IV, including slipped inverted rim bowls and jars with exterior rilling, while the uppermost pottery resembles tomb deposits from Family NC and some settlement assemblages from Family J normally placed before the end of Early Bronze IV. These typological expectations suggest that Early Bronze IV settlement at other sites in the Southern Levant may have started earlier or ended later than at Tell Abu en-Ni'aj.

Tell El-Hayyat

Tell el-Hayyat embodies a 0.5 ha village 1.5 km northeast of Tell Abu en-Ni'aj in the midst of modern agricultural fields above the Jordan River floodplain (Fig. 1).[18] Excavation of 8% of the site area revealed 4 m of deposits comprised of six architectural strata.[19] At the base of the tell, Phase 6 deposits just above archaeologically sterile sediment include exclusively Early Bronze IV hand built vessels, with a few examples (e.g., small trickle-painted cups) finished on a slow wheel. Vessel forms find their closest parallels with other assemblages in Dever's Families J, N and NC late in Early Bronze IV.[20] Hayyat's Phase 5 pottery constitutes a very early Middle Bronze I assemblage combining transitional Early Bronze IV/Middle Bronze I wares and hand built versions of Middle Bronze vessel forms.[21] Phases 5–2 reveal a settlement of Middle Bronze Age houses, courtyards and alleys centered on a series of four stratified Canaanite temples *in antis*.[22] Wheel-thrown vessel forms with parallels across the Southern Levant suggest Middle Bronze I, II, and III habitation in Phases 4–1.[23] In Phase 2, a cache of votive bowls and cups has clear Middle Bronze II parallels elsewhere, while the appearance of Chocolate-on-White Ware extends this phase into Middle Bronze III on typological grounds.[24] Phase 1 provides fragmentary architectural remains of the village's final occupation in Middle Bronze III marked by further examples of Chocolate-on-White Ware and other late Middle Bronze Age ceramic types.[25]

In overview, the stratigraphy and associated ceramic assemblages from Tell Abu en-Ni'aj and Tell el-Hayyat comprise 13 architectural phases spanning Early Bronze IV and the Middle Bronze Age. The traditional chronologies associated with these ceramic forms would suggest occupation at en-Ni'aj from roughly 2300/2200 BCE (or slightly later) to 2000 BCE (or slightly earlier), and at Hayyat from about 2000 to 1550/1500 BCE (Table 1).[26] Bayesian models of new AMS sequences from both sites inspire detailed reconsideration of these ascribed timespans, and associated implications for Levantine Bronze Age chronology and correlation with Egyptian history.

Methods

Burned archeological sediments at Tell Abu en-Ni'aj and Tell el-Hayyat with visible organic content (e.g., in small hearths, shallow depressions in surfaces)

Table 1: Chronological revision for the occupations of Middle Bronze Age Tell el-Hayyat and Early Bronze IV Tell Abu en-Ni'aj. AMS ages based on phase boundary medians produced by Bayesian analysis of 14 radiocarbon ages from Tell el-Hayyat and 24 radiocarbon ages from Tell Abu en-Ni'aj.

	Ceramic Age (BCE)	AMS Age (cal BCE)
	2100–1550 BCE (550-year span)	1950–1650 cal BCE (300-year span)
Tell el-Hayyat		
Phase 1 (MBIII)	1600–1550	1730–1650
Phase 2 (MB II/III)	1700–1600	1790–1730
Phase 3 (MB I/II)	1800–1700	1820–1790
Phase 4 (MB I)	1900–1800	1860–1820
Phase 5 (early MBI)	2000–1900	1910–1860
Phase 6 (late EBIV)	2100–2000	1950–1910

	Ceramic Age (BCE)	AMS Age (cal BCE)
	2350–2000 BCE (350-year span)	2545–2035 cal BCE (510-year span)
Tell Abu en-Ni'aj		
Phase 1	2050–2000	2190–2035
Phase 2	2100–2050	2330–2190
Phase 3	2150–2100	2380–2330
Phase 4	2200–2150	2420–2380
Phase 5	2250–2200	2455–2420
Phase 6	2300–2250	2490–2455
Phase 7	2350–2300	2545–2490

were processed by water flotation to recover plant macrofossils.[27] The floated organic fraction from each sample was poured through nested 4.75 mm, 2 mm, 1 mm and 0.5 mm mesh sieves to recover carbonized seeds and charcoal. All material 0.5 mm or larger was sorted under a binocular microscope[28] and seeds were identified from Fall's personal reference collection and from comparative literature.[29] Seeds from short-lived cultigens representing all seven phases at Tell Abu en-Ni'aj and all six phases at Tell el-Hayyat were submitted for AMS ^{14}C analysis.

We calibrated the ^{14}C ages in this study using OxCal 4.2.4[30] and the IntCal13 calibration curve.[31] We conducted our Bayesian analyses by applying the modeling tools in OxCal 4.2.4 to these calibrated ages. Bayesian modeling of ^{14}C ages coordinates the analysis of large suites of calibrated ^{14}C determinations, thereby providing robust probabilistic chronologies for individual sites and across larger regions.[32] In doing so it accommodates the non-normal distributions of calibrated ^{14}C ages, and enables the construction of modeled radiocarbon sequences based on prior stratigraphic information, such as the stratified excavation data available from Tell Abu en-Ni'aj and Tell el-Hayyat.

Results

A sequence of 24 radiocarbon age determinations from Tell Abu en-Ni'aj[33] pertains to the length of Early Bronze IV and its correlation with Egypt's First Intermediate Period. Likewise, a new sequence of 14 ^{14}C ages from Tell el-Hayyat, including previously unpublished ages from Phases 6, 3, 2 and 1, addresses the Early Bronze/Middle Bronze transition, the end of the Middle Bronze Age, and their linkages with Egyptian dynastic changes (Table 2).

Tell Abu en-Ni'aj

The radiocarbon sequence from Tell Abu en-Ni'aj includes 24 seed dates distributed through all seven strata.[34] These dates constitute a series of contiguous phases in light of the continuous record of Early Bronze IV occupation at Abu en-Ni'aj from basal Phase 7 to uppermost Phase 1. For the purpose of our analysis we ordered the ^{14}C ages within each stratum as a phase. Bayesian modeling estimates that Phase 7 started within a one-sigma range of 2591–2486 cal BCE and that Phase 1 ended 2118–1970 cal BCE.[35] Our Bayesian model entails the removal of two statistical outliers[36] (AA-90067; AA-90071) and produces A_{model}=122.7. This model proposes an occupational span of approximately 510 years at Tell Abu en-Ni'aj or an average of about 70–75 years per phase, based on modeled boundary medians (Table 1). More specifically, the lengths of the earlier strata (Phases 7–3) are estimated at about 35–55 years each, while the uppermost strata (Phases 2 and 1) are modeled at roughly 150 years each. The overall Bayesian analysis of 22 ^{14}C ages from Tell Abu en-Ni'aj (excluding the two outliers) models Early Bronze IV occupation beginning between 2600 and 2500 cal BCE, and ending between 2100 and 2000 cal BCE.

Tell el-Hayyat

Our current Bayesian modeling incorporates 14 AMS seed ages from all six stratigraphic phases at Tell el-Hayyat. This analysis includes five new dates and excludes four previous dates with large standard deviations (AA-1236, 1237, 1238, 1239), three of which emerged as statistical outliers in prior modeling (Table 2).[37] These dates are arranged chronologically within contiguous phases based on the continuous stratification at Tell el-Hayyat. Bayesian modeling estimates a starting boundary for Phase 6 with a one-sigma range of 1976–1906 cal BCE and an ending boundary range for Phase 1 of 1730–1602 cal BCE, and provides A_{model}=124.3 (Fig. 2). The boundary medians produced by Bayesian modeling suggest about 300 years of habitation at Tell el-Hayyat between approx. 1950 cal BCE and 1650 cal BCE. Modeling of the six phases at Hayyat suggests an average length of about 50 years each based on modeled boundary medians, with individual phases ranging between 30 and 80 years in length.

Discussion

A growing body of radiocarbon-based studies[38] proposes that Early Bronze III ended about 300 years earlier than estimated by orthodox chronologies. Modeling of the subsequent Early Bronze IV has been hindered by a dearth of stratified, radiometrically dated Early Bronze IV sites. AMS ages from Tell Abu en-Ni'aj support a robust Bayesian model of habitation over about 500 years, starting at or before 2500 cal BCE and ending just before 2000 cal BCE.[39] This sequence implies that Early Bronze IV may stretch even longer, since the stratification at Tell Abu en-Ni'aj is not bounded by an earlier Early Bronze III stratum or a subsequent Middle Bronze I stratum. Further, typological assessment suggests that the earliest and latest Early

Table 2: AMS radiocarbon results for seed samples from Tell el-Hayyat, Jordan (ordered by lab and sample number). Calibration based on OxCal 4.2.4 using the IntCal13 atmospheric curve. Stratigraphic phases at Tell el-Hayyat start with Phase 6 (earliest, basal stratum) and end with Phase 1 (latest, uppermost stratum). Context is indicated according to Excavation Unit, Locus and Bag (e.g., F.049.288 = Unit F, Locus 049, Bag 288). *Not used in Bayesian Analysis (Figure 2). *(Continued on next page.)*

Lab Number	$\Delta^{13}C$ ‰	$F^{14}C$	Conventional ^{14}C age yr BP	Calibrated 1s ranges yr BCE (probability)	Calibrated 2s ranges yr BCE (probability)	Median Age Cal yr BCE	Archaeological context Material dated; references
AA-1236*	-30.2	0.650±0.008	3460±100	1897–1657 (66.7%) 1652–1645 (1.5%)	2031–1527 (95.4%)	1783	Phase 5, F.049.288, surface *Lens culinaris*; Falconer & Fall 2006: table 4.2; Marcus 2003, 2010
AA-1237*	-26.0	0.665±0.009	3280±100	1665–1446 (68.2%)	1876–1842 (1.7%) 1820–1797 (0.9%) 1781–1376 (90.7%) 1346–1304 (2.1%)	1568	Phase 4, F.040.235, surface *Olea europaea* seeds; Falconer & Fall 2006: table 4.2; Marcus 2003, 2010;
AA-1238*	-23.1	0.639±0.005	3600±60	2111–2105 (1.4%) 2036–1883 (66.8%)	2136–1865 (85.3%) 1850–1773 (10.1%)	1961	Phase 4, C.070.001, surface *Lens culinaris*; Falconer & Fall 2006: table 4.2; Marcus 2003, 2010
AA-1239*	-25.1	0.694±0.007	2930±80	1257–1251 (1.3%) 1231–1013 (66.9%)	1386–1340 (4.2%) 1316–920 (91.2%)	1134	Phase 5, F.045.258, ash lens *Punica granatum* seeds; Falconer & Fall 2006: table 4.2; Marcus 2003, 2010
AA-108789	-23.8	0.6474±0.0024	3493±30	1879–1837 (25.7%) 1832–1771 (42.5%)	1896–1741 (93.7%) 1711–1700 (1.7%)	1817	Phase 2, A.026.013, ash lens *Hordeum* seeds
AA-108790	-23.0	0.6488±0.0022	3475±28	1877–1841 (26.2%) 1821–1797 (17.0%) 1782–1748 (25.0%)	1886–1737 (89.9%) 1715–1696 (5.5%)	1806	Phase 3, C.022.009, tabun *Hordeum* seeds
AA-108791	-24.0	0.6394±0.0027	3593±34	2011–2000 (7.5%) 1978–1902 (60.7%)	2111–2104 (0.5%) 2036–1878 (94.3%) 1838–1829 (0.7%)	1949	Phase 6, H.073.482, surface *Hordeum* seeds
AA-108792	-22.3	0.6398±0.0022	3588±28	1973–1897 (68.2%)	2024–1885 (95.4%)	1942	Phase 6, H.073.482, surface *Hordeum* seeds
AA-108793	-22.6	0.6588±0.0022	3352±27	1683–1618 (68.2%)	1737–1715 (5.2%) 1695–1606 (82.5%) 1584–1545 (7.8%)	1646	Phase 1, L.006.079, ash lens *Hordeum* seeds

Table 2: *(Continued from previous page.)* AMS radiocarbon results for seed samples from Tell el-Hayyat, Jordan (ordered by lab and sample number). Calibration based on OxCal 4.2.4 using the IntCal13 atmospheric curve. Stratigraphic phases at Tell el-Hayyat start with Phase 6 (earliest, basal stratum) and end with Phase 1 (latest, uppermost stratum). Context is indicated according to Excavation Unit, Locus and Bag (e.g., F.049.288 = Unit F, Locus 049, Bag 288). *Not used in Bayesian Analysis (Figure 2).

Lab Number	$\Delta^{13}C$ ‰	$F^{14}C$	Conventional ^{14}C age yr BP	Calibrated 1s ranges yr BCE (probability)	Calibrated 2s ranges yr BCE (probability)	Median Age Cal yr BCE	Archaeological context Material dated; references
OxA-10986	-22.4	—	3470±36	1877–1841 (24.8%) 1822–1796 (16.6%) 1782–1744 (26.8%)	1887–1692 (95.4%)	1799	Phase 5, E.102, ash lens *Triticum aestivum*; Falconer & Fall 2006: table 4.2; Marcus 2010
OxA-10987	-22.9	—	3497±37	1882–1860 (13.8%) 1854–1771 (54.4%)	1919–1739 (92.7%) 1713–1698 (2.7%)	1820	Phase 5, H.067, ash lens *Triticum aestivum*; Falconer & Fall 2006: table 4.2; Marcus 2010
OxA-10988	-21.3	—	3502±37	1884–1860 (15.0%) 1854–1771 (53.2%)	1924–1741 (93.6%) 1711–1700 (1.8%)	1823	Phase 4, E.092, tabun fill *Olea europaea* seed; Falconer & Fall 2006: table 4.2; Marcus 2010
OxA-10989	-21.3	—	3523±39	1909–1866 (23.9%) 1849–1774 (44.3%)	1952–1744 (95.4%)	1840	Phase 4, J.074, ash lens *Olea europaea* seed; Falconer & Fall 2006: table 4.2; Marcus 2010
VERA-2037	-21.1±1.3	—	3555±40	1955–1876 (52.8%) 1842–1820 (9.1%) 1797–1781 (6.3%)	2020–1993 (5.1%) 1983–1768 (90.3%)	1901	Phase 5, E.102, ash lens *Triticum aestivum*, humic acids; Falconer & Fall 2006: table 4.2; Marcus 2010
VERA-2038	-21.9±2.1	—	3530±60	1938–1771 (68.2%)	2025–1735 (92.6%) 1717–1695 (2.8%)	1857	Phase 5, H.067, ash lens *Triticum aestivum*; Falconer & Fall 2006: table 4.2; Marcus 2010
VERA-2038W	-22.5±0.6	—	3565±30	1956–1881 (68.2%)	2021–1992 (5.2%) 1983–1872 (79.0%) 1845–1812 (6.7%) 1802–1777 (4.5%)	1916	Phase 5, H.067, ash lens *Triticum aestivum*; Falconer & Fall 2006: table4.2; Marcus 2010
VERA-2039	-23.4±1.5	—	3495±35	1880–1771 (68.2%)	1911–1739 (92.8%) 1713–1698 (2.6%)	1818	Phase 4, E.092, tabun fill *Olea europaea* seed, humic acids; Falcone& Fall 2006: table 4.2; Marcus 2010
VERA-2040	-24.0±1.5	—	3500±35	1883–1861 (14.0%) 1853–1771 (54.2%)	1919–1741 (93.8%) 1711–1700 (1.6%)	1822	Phase 4, J.074, ash lens *Olea europaea* seeds; Falconer & Fall 2006, table 4.2; Marcus 2010

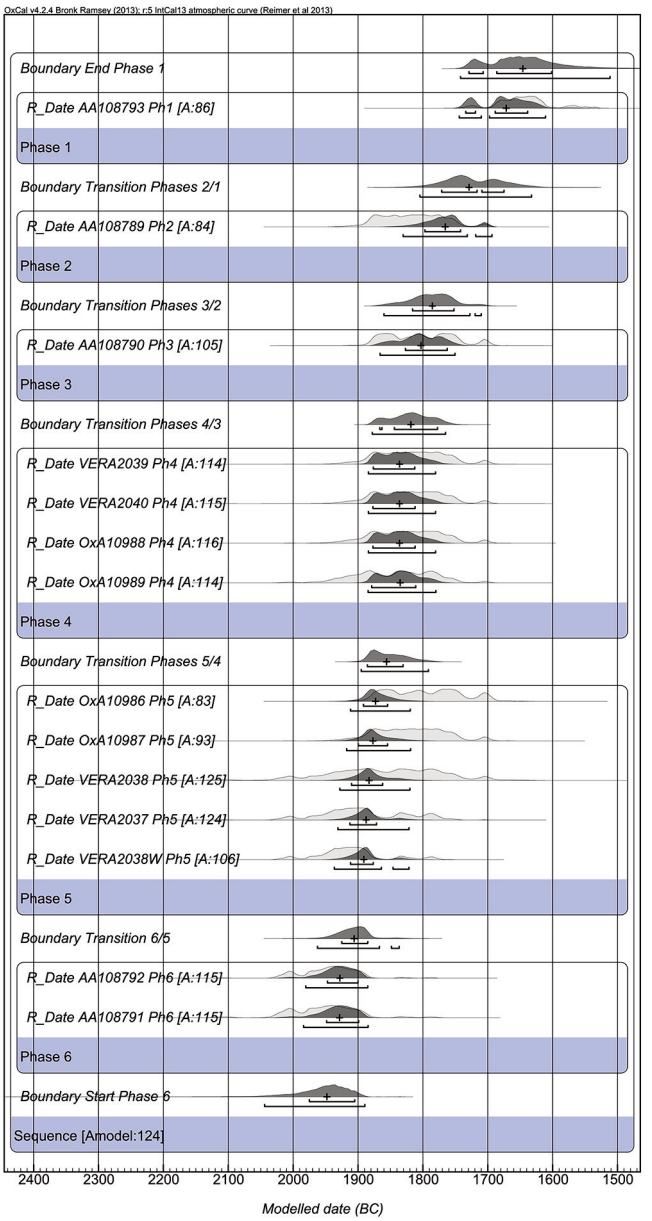

Figure 2: Bayesian sequencing of ^{14}C dates for seed samples from Tell el-Hayyat, Jordan. Light gray curves indicate single-sample calibration distributions; dark curves indicate modeled calibration distributions. Calibration and Bayesian modeling based on OxCal 4.2.4 using the IntCal13 atmospheric curve.

Bronze IV pottery types in Dever's Pottery Families may not be represented in the Abu en-Ni'aj ceramic evidence. These considerations open the possibility that Early Bronze IV may have covered more than a half millennium, at least in some locales. In the Northern Levant, both Tell Arqa and Tell Fadous-Kfarabida provide six-date Early Bronze IV AMS sequences beginning well before 2500 cal BCE.[40] In the Southern Levant, AMS samples from Be'er Resisim and Ha-Gamal likewise date prior to 2500 cal BCE,[41] and age determinations from Ein-Ziq and Khirbet Iskander[42] corroborate a beginning for Early Bronze IV no later than this date. While some of these ages might be viewed cautiously,[43] in sum they portray the start of the Early Bronze IV no later than 2500 cal BCE and suggest that the beginning of Early Bronze IV may have been time-transgressive, possibly beginning earlier in the Northern Levant than in the Southern Levant. All of these results, from Tell Abu en-Ni'aj and across the Northern and Southern Levant, argue strongly against the contemporaneity of the Levantine Early Bronze IV Period and Egypt's First Intermediate Period. The beginning of Early Bronze IV clearly predates the historically established start of the First Intermediate Period about 2200 BCE,[44] and recent radiocarbon evidence does not suggest that this date should be shifted earlier.[45]

In similar fashion, the transition between the First Intermediate Period and the Middle Kingdom in Egypt may no longer provide an unquestionable benchmark for the Early Bronze/Middle Bronze transition in the Levant. Previous comparisons of radiocarbon determinations and Egyptian historical chronology have led to a conventional date of around 2000 BCE for this juncture.[46] However, noteworthy radiocarbon sequences from Jericho, Tell Ifshar, and Tell Nami in the Southern Levant clearly begin after this date.[47] Further, radiocarbon modeling for the Southern Levant must accommodate a near absence of sites with stratified AMS ages spanning the Early Bronze IV/Middle Bronze Age interface. Tell el-Hayyat offers rare radiometric documentation of this transition on the basis of Bayesian modeling for Phases 6–4, which provide ceramic assemblages dating typologically to Early Bronze IV and Middle Bronze I. Bayesian modeling estimates intervals of about 40–50 years each for these phases, placing the Early Bronze IV/Middle Bronze I transition at about 1900 cal BCE (Fig. 2), in keeping with a similar date suggested by Cohen.[48] Our modeling shifts this transition a century later than expected normally, based on both the late persistence of Early Bronze IV evidence in Phase 6 and the subsequent late appearance of typologically incipient Middle Bronze I material in Phase 5. The wheel-thrown ceramics and associated AMS ages in

Phase 4 place this typologically homogeneous Middle Bronze I assemblage about 1860–1820 cal BCE. While both our original and revised chronologies end Phase 4 around 1800 BCE, Bayesian modeling of 11 AMS ages reduces Phases 6-4 from 300 to about 150 years, and repositions the Early Bronze/Middle Bronze interface approximately a century later than assumed traditionally. In conjunction with AMS sequences commencing well after 2000 cal BCE elsewhere in the Southern Levant, the evidence from Tell el-Hayyat questions the straightforward equation of the beginnings of Levantine Middle Bronze Age and the Egyptian 12th Dynasty, as well as the axiomatic use of Egyptian Middle Kingdom political reunification to explain the reestablishment of Levantine urbanized society.

Bayesian modeling of the upper end of the Hayyat sequence, based on our newest ages from Phases 3–1, likewise abbreviates our previously expected timespan for the latter part of the Middle Bronze Age from about 250 to approx. 150 years. Our estimate for the Middle Bronze I/II interface about 1800 cal BCE (as represented by Hayyat Phase 3) is later than suggested at Tell Burak, Lebanon[49] but earlier than surmised by Bietak[50] or Sharon[51] by 50–100 years. The ceramics and radiocarbon evidence from Phase 2 suggest an MB II/III transition in the 18th century BCE, earlier than suggested elsewhere in the Southern Levant.[52] The ceramics from Tell el-Hayyat Phases 2 and 1 are noteworthy for their typological parallels with assemblages at other late Middle Bronze Age sites, which place these phases at Hayyat toward the end of Middle Bronze II-III. Thus, on ceramic typological grounds, the modeled end boundary for the Hayyat sequence, with a median of 1647 cal BCE should lie at or near the end of the Middle Bronze Age. As with our modeling of the start of the Levantine Middle Bronze Age, this result suggests that Egyptian political disruption (e.g., related to the Hyksos "expulsion" at least a century later) may not provide an appropriate datum or explanation for the Middle Bronze/Late Bronze transition in the Jordan Valley and elsewhere in the Southern Levant.

Conclusions

Bayesian models of calibrated AMS radiocarbon sequences from Tell Abu en-Ni'aj and Tell el-Hayyat, Jordan contribute to significantly revised Levantine Early Bronze IV and Middle Bronze Age chronologies, and reconsideration of their presumed correlations with Egyptian dynastic history. Our analysis shows that seven stratified phases of Early Bronze IV settlement at Abu en-Ni'aj cover 500 years or more, starting at or before 2500 cal BCE, ending just before 2000 cal BCE, and thus extending well before the timeframe and influence of political decentralization during Egypt's First Intermediate Period. Likewise, Bayesian analysis shows that the lower three phases at Tell el-Hayyat portray an Early Bronze/Middle Bronze transition in which Early Bronze IV (Phase 6) persists well into the second millennium ca. 1950–1900 cal BCE. The appearance of Middle Bronze Age evidence follows in Hayyat Phases 5 and 4 about 1900–1800 cal BCE, framing an Early Bronze/Middle Bronze interface ca. 1900 BCE, a century later than ascribed commonly for the ascension and influence of Egypt's politically reunified 12th Dynasty. Finally, the modeled end of Middle Bronze III settlement at Tell el-Hayyat sets the stage for a Middle Bronze/Late Bronze transition in the Jordan Valley well before the Hyksos disruptions of the mid-second millennium BCE. These inferences contribute to ongoing radiometric revisions of Bronze Age chronology across the Levant and reconsideration of previously assumed chronological and explanatory linkages with Egyptian political history.

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