Article:

Orton, David Clive orcid.org/0000-0003-4069-8004, Anvari, Jana, Gibson, Catriona et al. (4 more authors) (2018) A tale of two tells:dating the Çatalhöyük West Mound. Antiquity. pp. 620-639. ISSN: 0003-598X

https://doi.org/10.15184/aqy.2018.91

ANTIQUITY
a review of world archaeology

A tale of two tells: dating the Çatalhöyük West Mound

Journal:	*Antiquity*
Manuscript ID	AQY-RE-17-113.R1
Manuscript Type:	Research
Date Submitted by the Author:	14-Nov-2017

Complete List of Authors:	Orton, David; University of York, Archaeology Anvari, Jana; Flinders University of South Australia, Department of Archaeology; Free University Berlin, Institute for Prehistoric Archaeology Gibson, Catriona; University of Reading, Department of Archaeology Last, Jonathan; Historic England, Landscape Strategy Bogaard, Amy; University of Oxford, Archaeology Rosenstock, Eva; Free University Berlin, Institute for Prehistoric Archaeology Biehl, Peter; State University of New York at Buffalo, Department of Anthropology

Keywords:	Neolithic, Chalcolithic, rapid climate change, radiocarbon, central Anatolia, tell settlements, Konya Plain
Research Region:	Middle East

A tale of two tells: dating the Çatalhöyük West Mound

David Orton, Jana Anvari, Catriona Gibson, Jonathan Last, Amy Bogaard, Eva Rosenstock, Peter F. Biehl

Introduction

The Anatolian Neolithic tell settlement of Çatalhöyük was investigated by James Mellaart in 1961–65, and by Ian Hodder and others from 1993 to 2017. Located on the Konya Plain, central Turkey, Çatalhöyük is famed for the densely-packed houses, under-floor burials, and rich symbolic tradition observed over much of the c.1200-year sequence on the intensively studied East Mound. Much less well known is Çatalhöyük's West Mound, subject to smaller-scale excavations by Mellaart and more recently (1998–2013) by various teams. Situated c.200m from the East Mound (Figure 1), across a former course of the Çarşamba river, Çatalhöyük West has traditionally been viewed as a separate, Early Chalcolithic site with an occupation commencing in the early sixth millennium BC, after the abandonment of the East Mound—with or without an intervening hiatus. Here, we present 33 AMS dates that conclusively demonstrate overlap in occupation on the two mounds. We argue that Çatalhöyük East and West should be seen as a single settlement whose focus of occupation shifted gradually, probably over one or two centuries around the turn of the seventh to sixth millennia BC. The implications of this argument go beyond Çatalhöyük: firstly shedding new light on supra-regional models linking late seventh-millennium settlement disruption to rapid climate change; secondly unsettling the idea of prehistoric tell settlements as discrete, bounded entities.

Cultural change at Çatalhöyük: recent research

The superficial impression of the Çatalhöyük sequence is of a continuous, large-scale Neolithic occupation, showing relative cultural and economic stability through the seventh millennium BC, until a rupture marked by disaggregation (e.g. Baird 2005: 69–74) and cessation of occupation on the East Mound—followed by apparently smaller-scale Early Chalcolithic reoccupation to the west. Under this model, the absence on the West Mound of many 'classic' Çatalhöyük features—underfloor burials, wall paintings, and bucrania to name just three—along with the proliferation of painted pottery and appearance of new architectural forms, could be taken as evidence of a major break-point, contrasting sharply with the preceding millennium of apparent stability. Disjunctures in the settlement record lend themselves to explanations invoking external factors, and in this case the '8200 cal BP' rapid climate change event has been proposed (Weninger et al. 2009: 33–34; Clare and Weninger 2014: 1; Clare 2016). The narrative of seventh-millennium stability at Çatalhöyük, however, is called into question by recent East Mound research, which has produced evidence for substantial diachronic changes after c.6500 BC (Hodder 2014). Meanwhile, new excavations on the West Mound (Gibson & Last 2003; Biehl et al. 2012) and uppermost East Mound (Marciniak & Czerniak 2007) have emphasised elements of continuity as well as change (Düring 2011: 133).

The East Mound: from continuity to change

Research at Çatalhöyük East has highlighted compelling evidence for a major shift in subsistence practices and social organisation at c.6500 BC (Hodder 2014). A decrease in overall population was accompanied by abandonment of the previous agglomerating settlement structure for a looser arrangement with large gaps between house clusters; houses were now fewer but larger and more complexly structured. These changes allowed households to manage resources with greater independence, and coincided with abandonment of several house-related practices argued to have promoted social cohesion between households (Düring & Marciniak 2005; Hodder 2013a, 2013b, 2014). Hodder (2014: 11) concludes that social organisation was characterised by egalitarianism throughout the sequence, but that social differentiation, competition and economic specialisation became more pronounced after 6500 BC. This heralded a period of ongoing social change, with further significant developments—including the disappearance of underfloor burials—observed after around 6300 BC (Marciniak et al. 2015). The East Mound's population continued to decline, with its north eminence probably abandoned by c.6300 BC; by 6000 BC the only known buildings are at the summit of the south eminence ('TP' area).

The onset of these changes coincides with an abrupt shift in subsistence. A series of changes in crop use, including the first appearance of hulled barley, occur c.6500 BC (Bogaard et al. 2017). The first clearly domesticated cattle appear, while aurochs (and equid) hunting declines sharply relative to the contribution of domestic sheep and goat (Russell et al. 2013). Herd kill-off patterns hint at a shift from pooled herds to household-level management, fitting the broader picture of household autonomy, while stable isotopes suggest that mobility around the site increased steadily (Pearson 2013; Hodder 2014), corresponding with the appearance of smaller (seasonal?) sites on the Konya Plain, such as Pınarbaşı B (Baird et al. 2011).

The West Mound: from change to continuity?

Given increasingly clear evidence for dynamism at Çatalhöyük East, could the shift to a new location simply represent one development amongst many in a time of changing settlement practices, rather than a radical break with the past? By the late seventh millennium, occupation had already contracted from both eminences of the East Mound to just the south; a subsequent (or concurrent) expansion to a third locus a few hundred metres to the west, albeit probably across a river channel, need not have been a major disruption of local lifeways, especially if gradual.

Continuity between the Mounds is supported by new research at Çatalhöyük West (Gibson and Last 2003; Biehl et al. 2012; Willett et al. 2016; Anvari et al. 2017). Even the highly visible changes in material culture arguably have East Mound roots: large, probably two-storied buildings can be linked to the rapid architectural changes seen in the TP area and to further expansion of household autonomy; the distinctive painted pottery is anticipated in the later East Mound sequence by new shapes and occasional decorated sherds (Last 2005; Yalman et al. 2013). Continuity in subsistence data is striking (Russell et al. 2013), meanwhile, and the appearance of further smaller settlements on the plain after c.6000 BC (Baird 2005: 71–73; Gibson in prep.) indicates acceleration of Late Neolithic trends in mobility and landscape use.

Wider significance

Changes at Çatalhöyük are set within a dramatically changing late-seventh-millennium cultural landscape. Following the widespread uptake of farming life in western and north-western Anatolia around 6500 BC, an increasingly diverse cultural landscape developed in Late Neolithic/Early Chalcolithic central, southern, and western Anatolia (Düring 2011a: 199; Baird 2012: 443), with innovations such as painted pottery and new crop/animal husbandry techniques exchanged between regions (Düring 2011: 199, 2013). The 8200 BP climate event has been posited as a cause for various social disruptions in Anatolia and beyond, including the East-West shift at Çatalhöyük (Weninger et al. 2009: 33–34; Clare and Weninger 2014; Clare 2016: 178), although its effect on central/western Anatolian environments and settlement processes is debated (Asouti 2009; Flohr et al. 2016; Willett et al. 2016; Ayala et al. 2017).

Evidence from Çatalhöyük is central to these debates, and the shift in occupation is a recurring issue: was it abrupt, gradual, or was there a break in occupation? So long as the timing of the West Mound's foundation *vis-à-vis* the East Mound's abandonment remains obscure, there can be no clear understanding of the translocation, nor what it meant for the community at Çatalhöyük, nor of any relationship to climatic events and wider cultural developments. This paper sets out to clarify that chronological relationship, paving the way for the construction of a unified settlement history of Çatalhöyük.

Previous dating at Çatalhöyük

The East Mound

Dating has concentrated on the higher southern eminence, where a 21m sequence divided into 'levels' XII (earliest) to 0 (latest) by Mellaart (1964) probably represents virtually the entire duration of occupation. Based on 26 radiocarbon dates from levels XII–II, Mellaart (1978: 13) estimated an occupation of c.7100–6300 BC. While his start date proved remarkably accurate (Bayliss et al. 2015), subsequent research has pushed the undated final levels steadily towards the end of the seventh millennium: Thissen (2002: 324) suggesting 6200–6100 BC and Cessford (2005: 77, see also 2001) 6200–5900 BC, the latter taking into account erosion and late dates from the off-site KOPAL excavation area (Table 1).

With recent excavations at the summit of the south eminence ('TP' area), dates finally became available for Mellaart's levels I–0 (Marciniak & Czerniak 2007; Marciniak et al. 2015). Abandonment of the latest known domestic building is now securely dated to 6015–5905 BC at 95% probability, with an 83% chance that interments continued in a nearby burial chamber after this point, while cessation of occupation is estimated as 5975–5865 BC at 95% probability, although two later dates from a midden suggest that sporadic activity continued beyond this point (Marciniak et al. 2015: 172–173).

More limited dating from shallower excavations on the lower north eminence indicate its abandonment by c.6300 BC (Hodder 2014: 4; see Cessford 2005; Stevanović 2012).

The West Mound

The West Mound has been subject to several campaigns. Mellaart's 1961 trenches—Trench 1 ('T1') close to the summit and T2 towards the south-western edge—were reopened and laterally extended in 1998–2003 along with two very small soundings (Trenches 3–4) on the eastern peripheries (Last 1998; Gibson and Last 2003). Three new trenches were excavated during 2006–2013: Trenches 5–6 towards the top of the mound's eastern 'shoulder' and T7 nearby on its very eastern edge (Biehl et al. 2012). Finally, T8 was excavated at the south-west of the mound during 2007–2012 (Erdoğu 2012).

The West Mound's dating has been contested from the outset: with no radiocarbon results until 2002, it was subject to revisions in the East Mound dating and to conflicting perceptions of wider central Anatolian cultural sequences. In Mellaart's view, painted pottery dated Çatalhöyük West to two phases of the Early Chalcolithic, EC I and II, indicating that it was "occupied after the desertion of the neolithic site, perhaps from *c.* 5600 B.C. [uncalibrated]" (1965: 135)—although he also remarked that unexcavated Late Neolithic levels *might* exist. Following calibration of the East Mound dates, Mellaart adjusted this to 6300 BC, retaining his—never explicitly justified—hypothesis of seamless transition: "`Around 6300 BC the site of Çatal Hüyük was moved across the river, for some reason still unknown to us, and rebuilt as Çatal Hüyük West" (1978: 23). By contrast, French (1967), placed Çatalhöyük West at c.5650–5500 BC (after calibration)—opening up a gap of 650–800 years between the mounds. This hiatus has persisted in the literature, though estimates of length vary: Thissen (2002: 324) tentatively dates Çatalhöyük West to 6000–5600 BC, only slightly postdating the East Mound in his model, while Schoop (2005: 129–131) argues for a four- to five-century hiatus and dates the West Mound 5700–5500 BC.

The first radiocarbon dates from the West Mound itself calibrate to c.6000–5800 BC (Göktürk et al. 2002; see Table 1). Being on unidentified charcoal these may be older than their context (the old wood effect); conversely being from c.25–40cm above natural alluvium in a core on the southern slope of the mound they may not represent the earliest anthropogenic deposits—especially given evidence for substantial colluviation in Trenches 3 and 4 (Last 1998). Nonetheless, based on these and the KOPAL dates Cessford (2005: 95) argues for "only a relatively brief interval between the occupation of the two sites, or possibly no interval at all"—a position subsequently supported by the TP dates (see above), although Weninger et al. (2009: 34) could still see a "glaring 200-year gap". Five dates from T7 (Biehl et al. 2012; Table 1) provide further support for continuity or even overlap between mounds—Poz-24048 at 6058–6005 BC (68.2%) and two more c.6000–5800 BC—but suffer from stratigraphic inconsistencies and are re-assessed below.

In sum, three models have been suggested for the East-West transition at Çatalhöyük each with different implications for the nature of social changes underlying the observed differences in material culture: (1) Mellaart's default hypothesis of seamless transition; (2) French's hiatus; and (3) an overlap—tentatively raised by Mellaart and recently revisited in response to the first radiocarbon dates from the West Mound and uppermost East Mound (Marciniak and Czerniak 2007: 123; Düring 2011: 133; Biehl et al. 2012: 59–60). Of these, recent evidence all but disproves an appreciable hiatus: East Mound occupation almost certainly lasted into the first century of the sixth millennium (Marciniak et al. 2015) while four—admittedly problematic—West Mound samples fall within a 6100–5800 BC window. The question that remains is between an abrupt transition or an overlap in occupation of decades or centuries. With the end of the East Mound sequence now definitively dated, it falls to us to resolve this issue through improved dating of the West Mound.

Samples and results

Four sets of AMS dates on short-life samples from Çatalhöyük West are presented here, deriving from Trenches 1, 2, 5, and 7. These are relatively shallow excavations (excluding T7), representing some of the latest occupation in their respective areas and lacking the multiple excavated building levels known from the East Mound (Figures 2–3). Of 34 samples, 32 produced successful determinations (Table 2). Sixteen samples from Trenches 1 and 2 previously appeared in a datelist (Higham et al. 2007), but are discussed here in context for the first time. Calibration and modelling used OxCal 4.3 (Bronk Ramsey 2009) and the IntCal13 calibration curve (Reimer et al. 2013).

Trench 1

Samples 1–11 are charred cereal grains from Building 25 in T1, associated with EC I pottery and adjacent to deposits excavated by Mellaart. A core taken beneath this building indicated a further 4.9m of anthropogenic deposits beyond the limit of excavation (Gibson et al. 2000).

Treating these as a single phase (Figure 4) gives estimated start and end dates of *6010–5935 BC and 5865–5780 BC respectively at 68.2% (6055–5900 and 5890–5720 at 95.4%)*—confirming that the West Mound was occupied during the first quarter of the seventh millennium, possibly back to 6000 BC, even before unexcavated deposits are taken into account.

Trench 2

Samples 12–16 are charred cereal grains from two intercutting pits in Trench 2, associated with EC II pottery as previously noted by Mellaart. These span a surprisingly long period (Figure 4): from *5860–5730 to 5600–5485 BC at 68.2% (6025–5665 to 5625–5320 at 95.4%)*, but by comparison to B.25 confirm Mellaart's relative chronology of EC I and EC II.

Trench 5

Samples 17–25 derive from three EC I building/infill sequences in T5. Being on *in situ* articulated bone, these dates are amenable to stratigraphic modelling, albeit limited by shallow stratigraphy and lack of crosslinks (Figure 5). This gives a tight date range with start and end boundaries of *5950–5860 BC and 5840–5760 BC respectively at 68.2% (6010–5845 and 5875–5710 at 95.4%)*. This evidence for occupation by c.5900 BC is again before underlying deposits are considered: the deepest T5 sample (S19) is from 1003.31m ASL, while nearby core 2006/1 indicates anthropogenic deposits in this vicinity begin at c.1000.23m, roughly 3m below the limit of excavation.

Trench 7

T7 was cut into the side of a 3.7m-deep modern irrigation ditch at the south-east edge of the mound, with a small 'deep sounding' continuing through a further c.2.8m of cultural deposits to reach natural lake marl. S26 derives from a surface with *in situ* EC I pots, towards the base of the main trench, while S27–34 are spread through the deep sounding. Only two articulated bone sets were available (S26 and S31); the remainder are disarticulated bone.

Although T7 produced five previous radiocarbon dates (Table 1; Biehl et al. 2012), their chronological order does not fit the stratigraphy. Poz-24051—from the interface with the natural—gives the latest date while Poz-24048—from the same surface as S26, stratigraphically above the deep sounding—gives the earliest. Residuality alone cannot be responsible: if correct, Poz-24051 would make the entire T7 sequence post-sixth-millennium, including *in situ* floors with EC pots. Contamination is more plausible: all five samples have C:N ratios outside the expected range for collagen (2.9–3.6; DeNiro 1985), with Poz-24051 particularly high (Figure 6). By contrast, all 16 new dates from T5 and T7 fall within the expected range.

The two articulated bone samples provide reliable anchors. S26 places the end-point of the dated sequence at *5715–5660 BC (68.2%)*, while S31—mid-way through the deep sounding—dates to *5790–5720 BC (Figure 7)*. The five disarticulated bone samples may be residual, particularly given the tell-edge stratigraphy and lack of secure contexts within the deep sounding. This is clear for S27–30, stratigraphically between S26 and S31 but significantly pre-dating both. S32–33 from below S31 may or may not be in more-or-less original context.

Our preferred—conservative—model for T7 fully includes only the two articulated samples, treating the others as *termini post quos* (model A, Figure 7) to produce a very uncertain start boundary of *5920–5715 BC (68.2%)*. *All* disarticulated samples pre-date 5800 BC, however, with two of five falling in the late 7th millennium. These probably represent activity in the broader vicinity—perhaps downwash—although we cannot entirely exclude East Mound origins. Modelling all T7 samples as a single phase (model B, Figure 7) gives a start boundary of *6210–6065 BC (68.2%)*.

Overall model

Figure 8 summarises a chronological model for the West Mound, with each dated trench/core included within an overall bounded phase of West Mound occupation (using model A for T7). Under this model, occupation lasted between *6015–5965 and 5615–5570 BC at 68.2% (6040–5935 and 5625–5530 at 95.4%).*

This almost certainly underestimates the antiquity of the mound considerably, given the metres of unexcavated deposits underlying T1 and T5. Nonetheless, Figure 9 compares start boundaries for our overall West Mound model and each Trench-level model with the estimated end dates reported for the East Mound, and more specifically for the final domestic structure (B.33) and burial chamber (Sp.248) respectively (Marciniak et al. 2015: Fig.2).

The visual impression is of a clear overlap in *activity* and probable overlap in *occupation*. This is confirmed by direct comparison between the start boundary for our overall model and the end boundary for Çatalhöyük East, giving an estimated overlap in occupation—ignoring unexcavated deposits—of *20–100 years at 68.2%*, or *between 150 years' overlap and 10 years' hiatus at 95.4%* (Figure 10).

Discussion

Our results confirm there was no hiatus between settlement on the two mounds at Çatalhöyük: dates from T1 and arguably T7 demonstrate that Çatalhöyük West was occupied by the first century of the sixth millennium, while activity on Çatalhöyük East persisted until at least the middle of the same century (Marciniak et al. 2015). A strong case can now be made for a significant period of overlap between the two tells, summarised as follows:

1. Based on 11 AMS determinations, deposits in T1 associated with B.25 begin at *6010–5935 BC (68.2%)*, matching the estimated end date for the last known domestic structure on the East Mound, B.33. The further 4.9m of anthropogenic deposits beneath B.25 must represent a significant period of prior activity. While the rate of tell formation at Çatalhöyük West is unknown, a very crude calculation based on the overall height (c.21m) and approximate duration (c.1150 years) of the East Mound gives an estimate of c.270 years.
2. Coring near Trench 5 indicates a further c.3m of tell deposits beneath the limit of excavation, again suggesting occupation commenced well before the *5950–5860 BC (68.2%)* estimated here—perhaps 160 years earlier using the same calculation as above.
3. Two of five disarticulated bone samples from T7 date to the late seventh millennium, the remainder to the first two centuries of the sixth. Even if all are residual, their most plausible source is further up the mound: it is unlikely that *both* early samples derived from the East Mound. Accepting this assumption and grouping all T7 samples as a simple phase gives a start boundary of *6210–6065 BC (68.2%)*.

Taking these points together, we propose a significant period of co-existence between the two tells at Çatalhöyük. We cannot reliably estimate its duration without excavation to the natural in a non-peripheral area of the West Mound, but even a conservative estimate of c.6100 BC for the start of occupation implies an overlap of up to two centuries.

The vision of two active mounds side-by-side on the plain for centuries is only surprising *per se* insofar as they are traditionally seen as discrete settlements with distinct communities. Viewed as a single settlement with shifting foci of occupation their co-existence need not require special explanation. Settlement on the East Mound had already shifted over time, notably with the abandonment of the north eminence during the latter half of the seventh millennium, and gradual transition from East to West seems *a priori* more likely than sudden translocation of the entire community—though there remains the question of *why* settlement shifted when it did. Explanations linked to changes in river course and/or water regime (Roberts & Rosen

2009: 399) may still apply, with some residents moving closer to the water supply while others chose to remain in the traditional settlement core. Alternatively, or additionally, we might be seeing social fissioning, linked to the increased household autonomy, competition, and mobility posited for the later seventh millennium at Çatalhöyük.

Despite evidence for Early Chalcolithic population dispersal on the Konya Plain (Baird 2005: 71), the East-West transition at Çatalhöyük need not have entailed reduction in population. Although the West Mound's footprint is smaller than that of the East Mound, the latter's population had already declined significantly by the later seventh millennium, with the abandonment of the northern eminence and decreasing settlement density on the southern (Baird 2012: 446). The extent to which this was balanced by expansion to the West Mound depends partly on the as-yet unknown chronological relationship between the West's foundation and the abandonment of the north eminence, but we cannot assume the population of Çatalhöyük West at its height was any smaller than that of late seventh-millennium Çatalhöyük East.

The early dating of T1 and T5 indicates either that the most visible material changes between Çatalhöyük East and West were very rapid—albeit with roots, as argued above, in the later East Mound sequence—or that their development represented a divergence in practices between the mounds. Dated deposits in all trenches are characterised by abundant painted pottery, pushing this development back to the second—probably first—century of the sixth millennium, while buttressed two-storey buildings are present in Trench 5, at least, by c.5900 BC.

That Çatalhöyük East and West were a single settlement does not preclude some degree of social differentiation between the two tells—decisions about relocation are likely to have been bound up with status, identity, and kinship, and there are also hints of functional differentiation. While burial played a central role in the TP area after c.6200 BC, no prehistoric adult burials are yet known from the West Mound. Interments in burial chambers on the East Mound apparently continued for 'a few decades' after the cessation of settlement activity (Marciniak et al. 2015: 154), with the obvious (though previously unstated) implication that those interred—and those who interred them—were residents of Çatalhöyük West. This may equally apply to some earlier burials: as the focus of occupation shifted West, burial—and perhaps other ritual activities—may have remained tied to the traditional settlement core. On the other hand domestic activity also persisted on the East Mound almost until its final abandonment—indeed two midden dates indicate sporadic activity even after this point (Marciniak et al. 2015: 173). The burial places of Çatalhöyük residents after c.5900 BC remain enigmatic.

Despite significant, rapid change in material culture, there was no sudden disjuncture in settlement at Çatalhöyük, no radical break in the sequence, and no need to invoke models entailing external disruption. Rather, reasons for the move may lie in internal processes with roots in a mid seventh-millennium shift in social organisation (Hodder 2014). Environmental stimuli, cultural contacts, and/or population movements might have contributed to these processes, and a gradual settlement shift starting in the late seventh millennium actually accommodates models involving the 8200 BP climate event rather better than would a sudden move around 6000 BC (Clare 2016, c.f. Flohr et al. 2016: 35). Nonetheless, suggestions that climate change caused an abrupt temporary abandonment of the settlement (Weninger et al. 2009: 33–34; Clare and Weninger 2014: 1) can no longer be sustained.

Conclusions

The East and West Mounds at Çatalhöyük had an appreciable overlap in occupation around 6000 BC, although its exact duration remains to be determined. They should thus be seen as parts of a single settlement, with a gradual shift probably beginning within the latter quarter of the seventh millennium and persisting until the first century of the sixth. While the reasons for this shift remain debatable, its gradual nature has two key implications for models of change at Çatalhöyük and in Central Anatolia more widely.

Firstly, it calls into question the idea that total population at Çatalhöyük declined rapidly throughout the later seventh millennium and into the sixth, associated with population dispersal on the Konya Plain and beyond. While East Mound population certainly declined after c.6500 BC, it remains to be seen from what point, and to what extent, this was offset by settlement at Çatalhöyük West. Secondly, it militates strongly against arguments for a radical disruption to settlement, whether caused by climatic change or by population movements. The rate of social change at Çatalhöyük, as in Anatolia more widely, was rapid in the later seventh and early sixth millennia, but the demonstration of continuity between the two mounds suggests this story is primarily one of fast-paced internal evolution. More widely, our findings present a cautionary tale regarding the assumption that prehistoric settlements are coterminous with their visible manifestations, particularly in the form of tells.

Acknowledgements

We thank the Çatalhöyük Research Project; the Ministry of Culture and Tourism of the Republic of Turkey; the University at Buffalo, Freie Universität Berlin, Alexander von Humboldt Foundation, University of Cambridge, British Academy, and several private donors; and numerous colleagues who have contributed to West Mound excavations. Particular thanks go to Craig Cessford, Chris Doherty, and Alex Bayliss. Dates from T5 and T7 were funded by the NERC Radiocarbon Facility (NF/2012/2/10; AB/DO) and the University of York. Useful comments on drafts were provided by Clive Orton, Tom Higham, and Penny Bickle.

References

ANVARI, J., J. BRADY, I. FRANZ, G. NAUMOV, D. ORTON, S. OSTAPTCHOUK, E. STROUD, P. WILLETT, E. ROSENSTOCK & P. BIEHL. 2017. The Çatalhöyük West Mound and the Early Chalcolithic in central Anatolia. In S.R. STEADMAN & G. MCMAHON (ed.) *The Archaeology of Anatolia: Recent Discoveries*, 6-39. Cambridge: Cambridge Scholars Publishing.

ASOUTI, E. 2009. The relationship between Early Holocene climate change and Neolithic settlement in Central Anatolia, Turkey: current issues and prospects for future research. *Documenta Praehistorica* 36: 1–5.

AYALA, G., J. WAINWRIGHT, J.WALKER, R. HODARA, J. LLOYD, M. LENG & C. DOHERTY 2017. Palaeoenvironmental reconstruction of the alluvial landscape of Neolithic Çatalhöyük, central southern Turkey: The implications for early agriculture and responses to environmental change. *Journal of Archaeological Science* 87: 30–43.

BAIRD, D. 2005. The history of settlement and social landscapes in the early Holocene in the Çatalhöyük area. In I. HODDER (ed.), *Çatalhöyük perspectives: Reports from the 1995–1999 seasons,* 55–74. Cambridge: McDonald Institute.

BAIRD, D. 2012. The Late Epipalaeolithic, Neolithic, and Chalcolithic of the Anatolian Plateau, 13,000-4000 BC. In D.T. POTTS (ed.) *A Companion to the Archaeology of the Ancient Near East*, 431–65. Oxford: Wiley.

BAIRD, D., D. CARRUTTHERS, A. FAIRBAIRN & J. PEARSON 2011. Ritual in the landscape: evidence from Pınarbaşı in the seventh-millennium cal BC Konya Plain. *Antiquity* 84: 380–94.

BAYLISS, A., F. BROCK, S. FARID, I. HODDER, J. SOUTHON & R.E. TAYLOR 2015. Getting to the bottom of it all: a Bayesian approach to dating the start of Çatalhöyük. *Journal of World Prehistory* 28: 1–26.

BIEHL, P.F., I. FRANZ, D.C. ORTON, S. OSTAPTCHOUCK, J. ROGASCH & E. ROSENSTOCK 2012. One community and two tells: the phenomenon of relocating tell settlements at the turn of the 7th and the 6th millennia in central Anatolia. In R. HOFMANN, F.-K. MOETZ & J. MÜLLER (ed.) *Tells: Social and Environmental Space*, 53–65. Bonn: Habelt.

BOGAARD, A., D. FILIPOVIĆ, M. CHARLES, A. FAIRBAIRN, L. GREEN, D.Q. FULLER & E. STROUD 2017. Agricultural innovation and resilience in a long-lived early farming community: the 1500-year sequence at Neolithic-early Chalcolithic Çatalhöyük, central Anatolia. *Anatolian Studies* 67: 1–28

BRONK RAMSEY, C. 2009. Bayesian analysis of radiocarbon dates. *Radiocarbon* 51: 337–60.

CESSFORD, C. 2001. A new dating sequence for Çatalhöyük. *Antiquity* 75: 717–25.

- 2005. Absolute dating at Çatalhöyük. In I. HODDER (ed.) C*hanging Materialities at Çatalhöyük: Reports from the 1995–1999 seasons*, 65–100. Cambridge: McDonald Institute.

CLARE, L. 2016. *Culture Change and Continuity in the Eastern Mediterranean During Rapid Climate Change*. Rahden: Leidorf.

CLARE, L. & B. WENINGER 2014. Absolute chronology and rapid climate change in Central and West Anatolia. In M. ÖZDOĞAN, N. BAŞGELEN & P. KUNIHOLM (ed.) *The Neolithic in Turkey Vol. 6*, 1–65. Istanbul: Arkeoloji ve Sanat Yayınları.

DENIRO, M.J. 1985. Post-mortem preservation and alteration of in vivo bone collagen isotope ratios in relation to paleodietary reconstruction. *Nature* 317: 806–9.

DÜRING, B.S. 2011. *The Prehistory of Asia Minor.* New York: Cambridge University Press.

– 2013. Breaking the Bond: Investigating The Neolithic Expansion in Asia Minor in the Seventh Millennium BC. *Journal of World Prehistory* 26: 75–100.

DÜRING, B.S. & A. MARCINIAK 2005. Households and communities in the Central Anatolian Neolithic. *Archaeological Dialogues* 12(2): 165–87.

ERDOĞU, B. 2012. West Mound Trench 8. *Çatalhöyük Archive Report* 2012: 103–4.

FLOHR, P., D. FLEITMANN, R. MATTHEWS, W. MATTHEWS & S. BLACK 2016. Evidence of resilience to past climate change in Southwest Asia: Early farming communities and the 9.2 and 8.2 ka events. *Quaternary Science Reviews* 136: 23–39.

French, D. 1967. Excavations at Can Hasan: sixth preliminary report, 1966. *Anatolian Studies* 17: 105–78.

GIBSON, C. in prep. Pottery in motion: Early Chalcolithic ceramic assemblages in the Konya Plain. In P.F. BIEHL, J. ANVARI & E. ROSENSTOCK (eds) *A Chalcolithic Village in Anatolia - The West Mound at Çatalhöyük.* Los Angeles: Cotsen Institute.

GIBSON, C., N. HAMILTON & J. LAST 2000. Excavations at Çatalhöyük West. *Çatalhöyük Archive Report 2000*.

GIBSON, C. & J. LAST, 2003. An early Chalcolithic building on the West Mound at Çatalhöyük. *Anatolian Archaeology* 9: 12–4.

GÖKTÜRK, E.H., D.J. HILLEGONDS, M.E. LIPSCHUTZ & I. HODDER 2002. Accelerator mass spectrometry dating at Çatalhöyük. *Radiochimica Acta* 90: 407–10.

HIGHAM, T., C. BRONK RAMSEY, F. BROCK, D. BAKER & R. DITCHFIELD 2007. Oxford AMS System: Archaeometry Datelist 32. *Archaeometry* 49: 1–60.

HODDER, I. 2013a. Becoming Entangled in Things. In I. HODDER (ed.), *Substantive Technologies at Çatalhöyük: Reports from the 2000–2008 seasons*, 1–25. Los Angeles: Cotsen Institute.

– 2013b. Dwelling at Çatalhöyük. In I. HODDER (ed.) *Humans and Landscapes of Çatalhöyük: Reports from the 2000–2008 seasons*, 1–30. Los Angeles: Cotsen Institute.

– 2014. Çatalhöyük: the leopard changes its spots. A summary of recent work. *Anatolian Studies* 64: 1–22.

LAST, J. 1998. Excavations on the West Mound at Çatalhöyük 1998. *Çatalhöyük Archive Report 1998*.

LAST, J. 2005. Pottery from the East Mound. I. Hodder (ed.) *Changing Materialities at Çatalhöyük: Reports from the 1995–1999 seasons*, 101–38. Cambridge: McDonald Institute.

MARCINIAK, A., M. BARAŃSKI, A. BAYLISS, L. CZERNIAK, T. GOSLAR, J. SOUTHON, R.E. TAYLOR 2015. Fragmenting times: interpreting a Bayesian chronology for the Late Neolithic occupation of Çatalhöyük East, Turkey. *Antiquity* 89: 154–76.

MARCINIAK, A. & L. CZERNIAK 2007. Social transformations in the Late Neolithic and the Early Chalcolithic periods in central Anatolia. *Anatolian Studies* 57: 115–30.

MELLAART, J. 1964. Excavations at Çatal Hüyük, 1962: second preliminary report. *Anatolian Studies* 14: 39–119.

– 1965. Çatal Hüyük West. *Anatolian Studies* 15: 135–56.

– 1978. *The Archaeology of Ancient Turkey*. Totowa: Rowman and Littlefield.

PEARSON, J. 2013. Human and animal diets as evidenced by stable carbon and nitrogen isotope analysis. In I. HODDER (ed.) *Humans and Landscapes of Çatalhöyük: Reports from the 2000–2008 seasons*, 271–99. Los Angeles: Cotsen Institute.

REIMER, P.J., E. BARD, A. BAYLISS, J.W. BECK, P.G. BLACKWELL, C. BRONK RAMSEY, C.E. BUCK, H. CHENG, R.L. EDWARDS, M. FRIEDRICH, P.M. GROOTES, T.P. GUILDERSON, H. HAFLIDASON, I. HAJDAS, C. HATTÉ, T.J. HEATON, D.L. HOFFMANN, A.G. HOGG, K.A. HUGHEN, K.F. KAISER, B. KROMER, S.W. MANNING, M. NIU, R.W. REIMER, D.A. RICHARDS, E.M. SCOTT, J.R. SOUTHON, R.A. STAFF, C.S.M. TURNEY & J. VAN DER PLICHT 2013. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. *Radiocarbon* 55: 1869–87.

ROBERTS, N. & A. ROSEN, 2009. Diversity and complexity in early farming communities of southwest Asia: new insights into the economic and environmental basis of Neolithic Çatalhöyük. *Current Anthropology* 50: 393–402.

RUSSELL, N., K.C. TWISS D.C. ORTON & G.A. DEMIRERGI 2013. Changing animal use at Neolithic Çatalhöyük, Turkey. In: B. DE CUPERE, V. LINSEELE & S. HAMILTON-DYER (eds) *Archaeozoology of the Near East 10,* 45–68. Leuven: Peeters.

SCHOOP, U.D. 2005. *Das Anatolische Chalkolithikum*. Remshalden: Greiner.

STEVANOVIĆ, M. 2012. Summary of the results of the excavation in the BACH area. In: R. TRINGHAM & M. STEVANOVIĆ (eds) *Last House on the Hill: BACH area reports from Çatalhöyük, Turkey*, 49–80. Los Angeles: Cotsen Institute.

THISSEN, L. 2002. Appendix I: The CANeW 14C Database, Anatolia 10,000–5000 cal BC. In F. GÉRARD & L. THISSEN (eds) *The Neolithic of central Anatolia*, 299–337. Istanbul: Ege Yayınları.

WENINGER, B., L. CLARE, E.J. ROHLING, O. BAR-YOSEF, U. BÖHNER, M. BUDJA, M. BUNDSCHUH, A. FEURDEAN, H.-G. GEBEL, O. JÖRIS, J. LINSTÄDTER, P. MAYEWSKI, T. MÜHLENBRUCH, A. REINGRUBER, G. ROLLEFSON, D. SCHYLE, L. THISSEN, H. TODOROVA & C. ZIELHOFER 2009. The impact of rapid climate change on prehistoric societies during the Holocene in the Eastern Mediterranean. *Documenta Praehistorica* 36: 7–59.

WILLETT, P.T., I. FRANZ, C. KABUKCU, D.C. ORTON, J. ROGASCH, E. STROUD, E. ROSENSTOCK & P.F. BIEHL 2016. The aftermath of the 8.2 Event: cultural and environmental effects in the Anatolian Late Neolithic and Early Chalcolithic. In P.F. BIEHL & O.P. NIEUWENHUYSE (eds) *Climate and Cultural Change in Prehistoric Europe and the Near East*, 95–115. Albany: SUNY Press.

YALMAN, N., D. TARKANÖ ZBUDAK & H. GÜLTEKIN 2013. The Neolithic Pottery of Çatalhöyük: Recent Studies. In I. HODDER (ed.) *Substantive Technologies at Çatalhöyük. Reports from the 2000–2008 Seasons*, 143–178. Los Angeles: Cotsen Institute.

Table captions

Table 1: previous radiocarbon dates from Çatalhöyük West, plus selected dates from KOPAL (off-site) and TP (East Mound).

Table 2: new dates from Çatalhöyük West.

Figure captions

Figure 1: Çatalhöyük East and West, showing approximate previous dating situation (plan: Çatalhöyük Research Project).

Figure 2: positions and elevations of interventions at Çatalhöyük West, with approximate sample provenances. Photographs: Jason Quinlan, Peter Biehl; T7 section: Ingmar Franz.

Figure 3: provenances of selected samples: (a) cluster 15365 in B.106 (S22–23); (b) fill layer 18343 in B.106 (S24); (c) fill layer 16981 on the floor of B.98 (S18); (d) surface 15107 in T7 (S26, Poz-24048). Photographs: Peter Biehl, Patrick Willett.

Figure 4: radiocarbon results from Trenches 1–2.

Figure 5: radiocarbon results from Trench 5.

Figure 6: radiocarbon ages of Trench 7 dates against (a) carbon:nitrogen ratio (C:N, grey band shows expected range); (b) elevation.

Figure 7: radiocarbon results from Trench 7.

Figure 8: overall chronological model for occupation at Çatalhöyük West, showing estimated start and end dates. Nb. does not account for unexcavated deposits.

Figure 9: estimated end dates for Çatalhöyük East (Marciniak et al. 2015) and start dates for Çatalhöyük West, plus selected un-modelled dates.

Figure 10: intervals between estimated start date for Çatalhöyük West and end dates for: (1) all East Mound occupation; (2) the last burial chamber in the TP area, and (3) the last domestic structure in the TP area. Negative numbers indicate overlap; positive numbers hiatus. Nb. does not account for unexcavated deposits.

TABLE 1

Lab no.	Area	Unit	Notes	Material	Species	Date	s.d.	$\delta^{13}C$	%C	%N	C:N	Reference
Poz-24048	West T7	15107	Surface with pots	Disarticulated. bone		7160	40		15.3	4.5	3.97	Biehl et al. 2012
Poz-24052	West T7	15133	Midden deposit	Disarticulated. bone		6630	40		12.3	3.2	4.48	Biehl et al. 2012
Poz-24049	West T7	15112	Deep sounding	Disarticulated. bone		6960	40		9.4	2.3	4.77	Biehl et al. 2012
Poz-24050	West T7	15115	Deep sounding	Disarticulated. bone		6990	40		14.5	4.0	4.23	Biehl et al. 2012
Poz-24051	West T7	15129	Deep sounding – basal	Disarticulated. bone		5910	80		8.9	1.9	5.46	Biehl et al. 2012
PL-980524A	Core ÇH96W			Charcoal		6940	80	-24.4				Göktürk et al. 2002
AA-27981	Core ÇH96W			Charcoal		7040	40	-24.8				Göktürk et al. 2002
PL-9800526B	KOPAL	2410	Buried soil/land surfaces	Charcoal		7180	80	-23				Cessford 2005
AA-27983	KOPAL	2410	Buried soil/land surfaces	Charcoal		7015	55	-23.2				Cessford 2005
OxA-10092	KOPAL	6020	Buried soil/land surfaces	Charred seeds	*Triticum*	7185	65	-22.2				Cessford 2005
Poz-40786	TP	7882	Sp.410 midden deposits	Articulated bone	*Ovis aries*	6720	40					Marciniak et al. 2015
Poz-40788	TP	7867	Sp.410 midden deposits	Articulated bone	*Ovis/Capra*	6870	50					Marciniak et al. 2015

TABLE 2

S#	Lab no.	Trench	Unit	Bone	Building	Space	Elevation	Notes	Material	Taxon	Date	s.d.	$\delta^{13}C$	$\delta^{15}N$	Yield	%C	C:N	Reference
1	OxA-11759	1	2957		B.25			Fill layer outside B25	Charred seeds	Cereal	7028	39	-23.6					Higham et al. 2007
2	OxA-11750	1	2960		B.25	189		Building fill	Charred seeds	Cereal	7065	40	-21.5					Higham et al. 2007
3	OxA-12089	1	2958		B.25	189		Building fill	Charred seeds	Cereal	6990	40	-22.2					Higham et al. 2007
4	OxA-11757	1	2951		B.25	189		Building fill	Charred seeds	Cereal	7103	39	-23.6					Higham et al. 2007
5	OxA-11758	1	2956		B.25	189		Pit fill	Charred seeds	Cereal	7028	37	-23.1					Higham et al. 2007
6	OxA-11751	1	6525		B.25	192		Fill of bin	Charred seeds	Cereal	7070	45	-23.5					Higham et al. 2007
7	OxA-11755	1	6534		B.25	192		Fill of bin	Charred seeds	Cereal	7049	39	-23.4					Higham et al. 2007
8	OxA-11756	1	6558		B.25	193		Building fill	Charred seeds	Cereal	6937	38	-20.8					Higham et al. 2007
9	OxA-11754	1	3488		B.25	194		Hearth (F.1358)	Charred seeds	Cereal	6945	39	-21.9					Higham et al. 2007
10	OxA-11773	1	3489		B.25	194		Hearth (F.1358)	Charred seeds	Cereal	6915	34	-23.9					Higham et al. 2007
11	OxA-11774	1	3490		B.25	194		Hearth (F.1358)	Charred seeds	Cereal	6969	36	-22.7					Higham et al. 2007
12	OxA-11760	2	2961					Fill of large pit	Charred seeds	Cereal	6904	39	-22.4					Higham et al. 2007
13	OxA-11761	2	2959					Fill of large pit	Charred seeds	Cereal	6730	40	-22					Higham et al. 2007
14	OxA-11764	2	2911					Fill of large pit	Charred seeds	Cereal	6707	38	-22.1					Higham et al. 2007
15	OxA-11762	2	2910					Fill of large pit	Charred seeds	Cereal	6662	38	-21.8					Higham et al. 2007
16	OxA-11763	2	2944					Pit fill	Charred seeds	Cereal	6626	36	-22.2					Higham et al. 2007
17	OxA-29613	5	16980	F88	B.98	341		Near-complete sheep foot, in situ on plaster floor	Articulated bone	*Ovis aries*	6912	36	-17.9	12.9	6.0	42.5	3.3	This paper.
18	OxA-29614	5	16981	X18	B.98	450	1003.92	Paired mandibles in situ on plaster floor	Articulated bone	*Bos taurus*	6944	36	-17.7	10.1	5.4	41.6	3.2	This paper.
19	OxA-29615	5	31227	X1	B.125		1003.37	Neonatal; unfused epiphysis present in situ in fill above floor	Articulated bone	*Ovis/Capra*	7007	36	-17.8	11.5	2.5	42.2	3.3	This paper.

20	OxA-27744	5	16939	F1	B.105	342		Unfused epiphysis present in situ in midden deposit within building	Articulated bone	*Ovis aries*	6986	36	-17.1	10.5	7.5	43.3	3.1	This paper.
21	OxA-27667	5	16939	F2	B.105	342		Unfused epiphysis present in situ in midden deposit within building	Articulated bone	*Ovis/Capra*	7059	37	-16.5	10.2	8.9	50.17	3.2	This paper.
22	OxA-27665	5	15365	F1	B.106	310		One of four vertebrae articulated in situ under probable plaster floor remains	Articulated bone	*Ovis/Capra*	6966	37	-16.6	10.6	4.8	43.6	3.2	This paper.
23	OxA-27666	5	15365	F6	B.106	310		One of four vertebrae articulated in situ under probable plaster floor remains	Articulated bone	*Equus sp.*	6992	36	-18.0	8.2	5.5	44.7	3.1	This paper.
24	OxA-27663	5	18343	F371	B.106	310		One of four vertebrae articulated in situ in midden deposit within building	Articulated bone	*Canis familiaris*	6918	38	-16.4	13.7	5.9	44	3.2	This paper.
	OxA-27664	5						[Duplicate run]	Articulated bone		6941	37	-16.7	13.5	5.0	44.1	3.2	This paper.
25	OxA-27662	5	18323	F8	B.106	310		Unfused epiphysis present in situ in midden deposit within building	Articulated bone	*Capra hircus*	6950	36	-17.0	10.9	7.2	43.9	3.2	This paper.
26	SUERC-59349	7	15107	F20			c.1001.4	Surface with pots. Unfused epiphysis present in situ.	Articulated bone	Ovis aries	6782	34	-18.7	7.5			3.3	This paper.
27	OxA-27672	7	16922	X2			1000.74	Deep sounding: cultural layer under plaster surface	Disartic. bone	Large ungulate	7247	36	-15.0	13.2	2.4	44	3.2	This paper.
28	P-33070	7	16922	X1			1000.36	Deep sounding: cultural layer under plaster surface	Disartic. bone	*Bos taurus*	Failed – insufficient collagen							This paper.
29	OxA-27671	7	16919	X1			1000.08	Deep sounding: cultural layer defined in section	Disartic. bone	*Ovis/Capra*	7013	40	-17.9	7.4	2.9	44.3	3.2	This paper.
30	OxA-27670	7	16918	X1			999.86	Deep sounding: cultural layer defined in section	Disartic. bone	*Ovis/Capra*	7074	36	-18.2	9.1	3.6	44.5	3.2	This paper.
31	SUERC-59350	7	15115	F15			c.999.6	Deep sounding: unfused epiphysis present in situ in cultural layer	Articulated bone	*Ovis/Capra*	6877	32	-19.5	9.5			3.5	This paper.
32	OxA-27669	7	16915	X1			999.32	Deep sounding: cultural layer defined in section	Disartic. bone	*Ovis/Capra*	7043	36	-18.1	9.4	1.7	48.4	3.2	This paper.
33	OxA-27668	7	16914	X1			998.95	Deep sounding: cultural layer immediately overlaying natural	Disartic. bone	*Ovis/Capra*	7205	36	-15.8	13.2	2.3	44	3.2	This paper.
34	P-33066	7	16914	X2			998.75	Deep sounding: cultural layer immediately overlaying natural	Disartic. bone	Small ungulate	Failed – insufficient collagen							This paper.

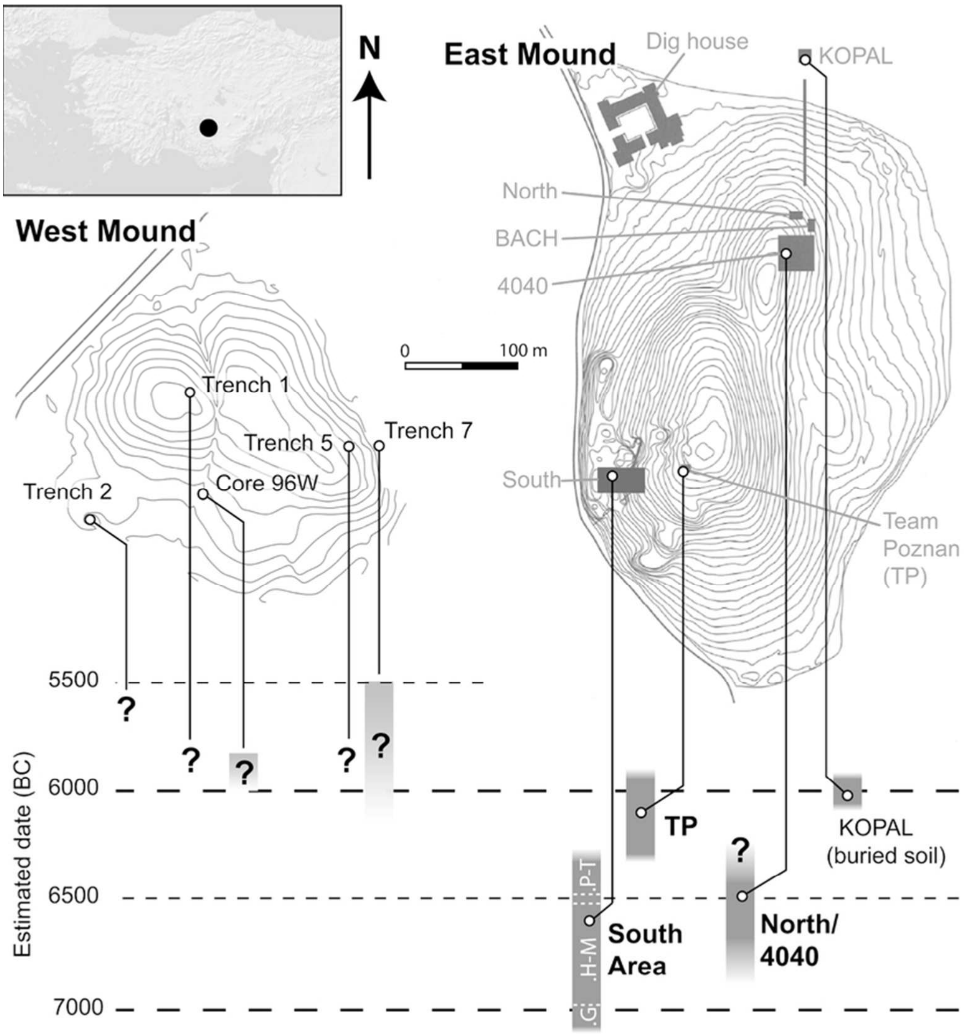

Figure 1: Çatalhöyük East and West, showing approximate previous dating situation (plan: Çatalhöyük Research Project).

70x77mm (300 x 300 DPI)

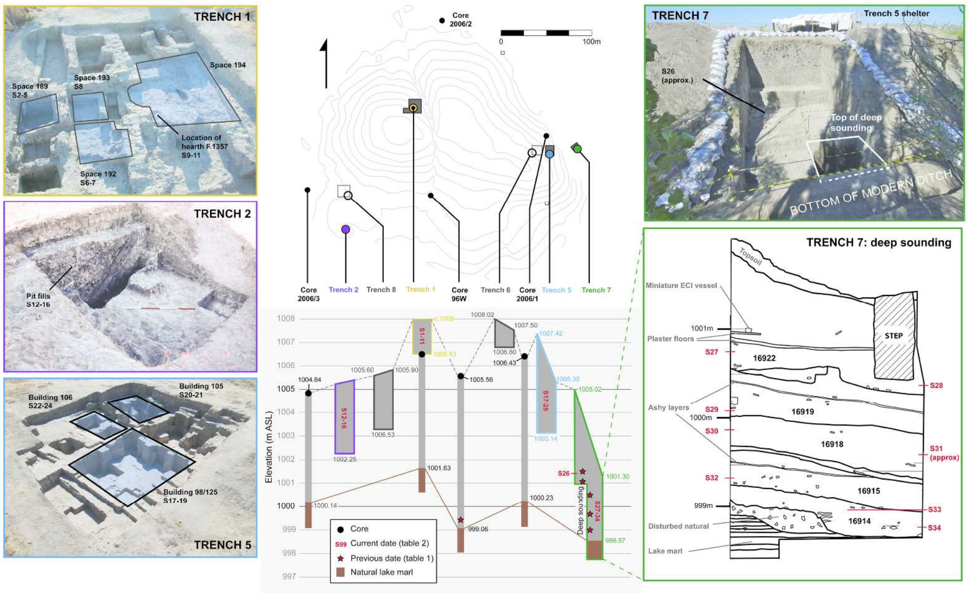

Figure 2: positions and elevations of interventions at Çatalhöyük West, with approximate sample provenances. Photographs: Jason Quinlan, Peter Biehl; T7 section: Ingmar Franz.

259x160mm (300 x 300 DPI)

Figure 3: provenances of selected samples: (a) cluster 15365 in B.106 (S22–23); (b) fill layer 18343 in B.106 (S24); (c) fill layer 16981 on the floor of B.98 (S18); (d) surface 15107 in T7 (S26, Poz-24048). Photographs: Peter Biehl, Patrick Willett.

89x59mm (600 x 600 DPI)

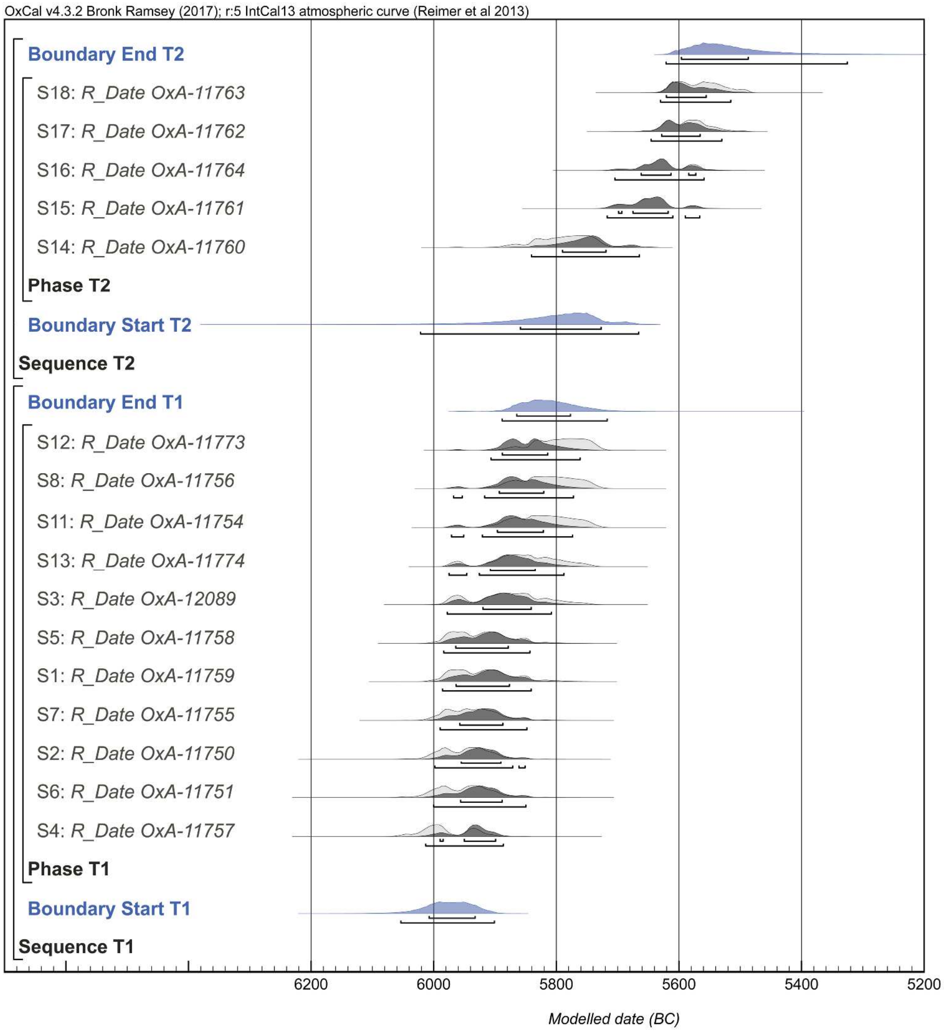

Figure 4: radiocarbon results from Trenches 1 and 2 at Çatalhöyük West.

146x158mm (600 x 600 DPI)

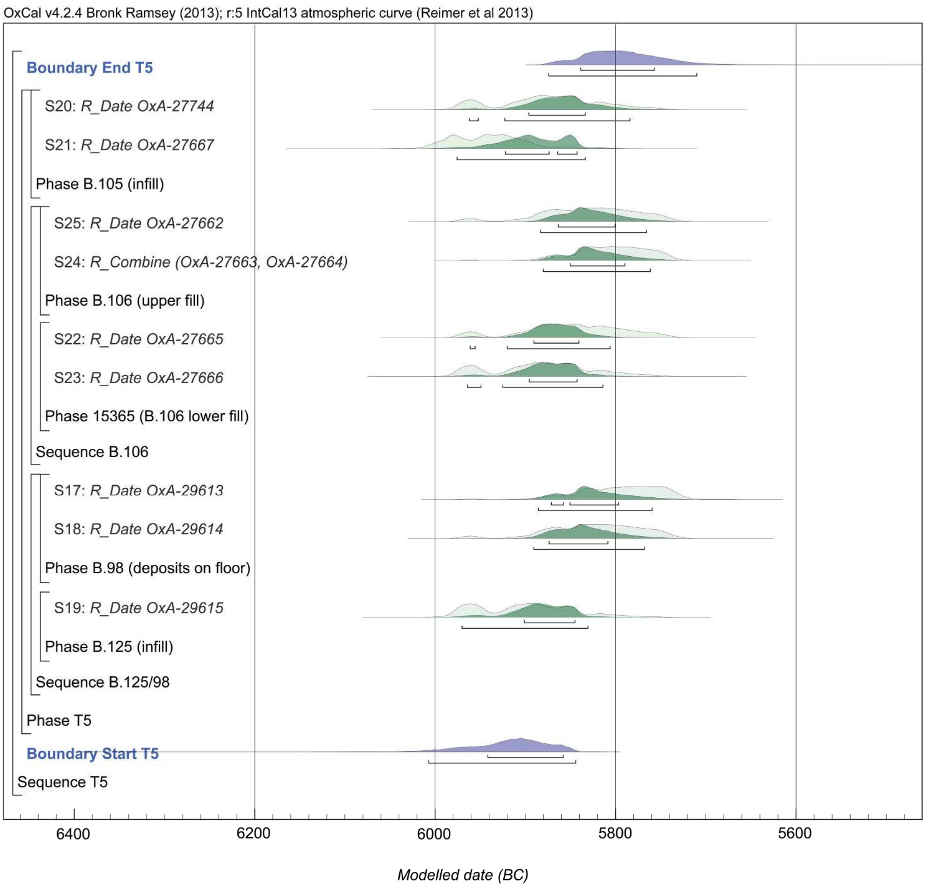

Figure 5: radiocarbon results from Trench 5 at Çatalhöyük West.

125x116mm (600 x 600 DPI)

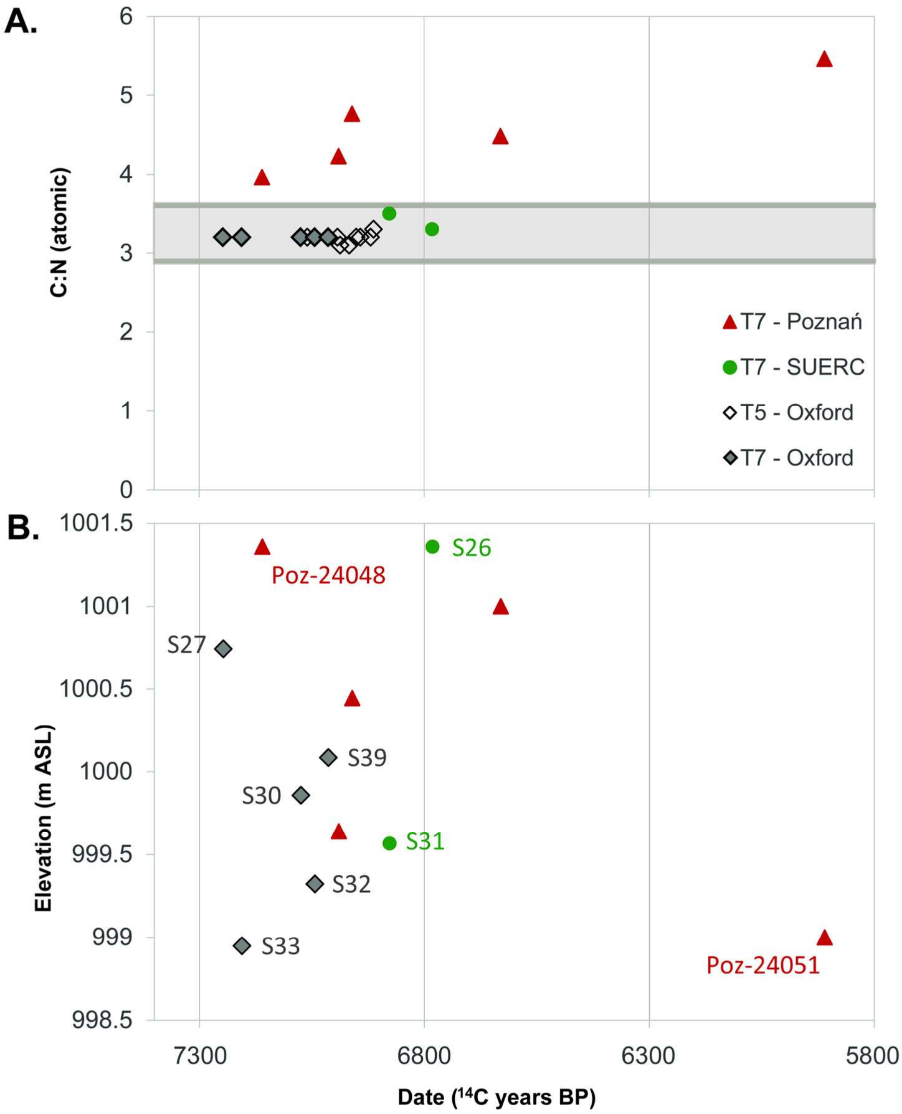

Figure 6: radiocarbon ages of Trench 7 dates against (a) carbon:nitrogen ratio (C:N, expected range shown as grey band; (b) elevation.

80x100mm (600 x 600 DPI)

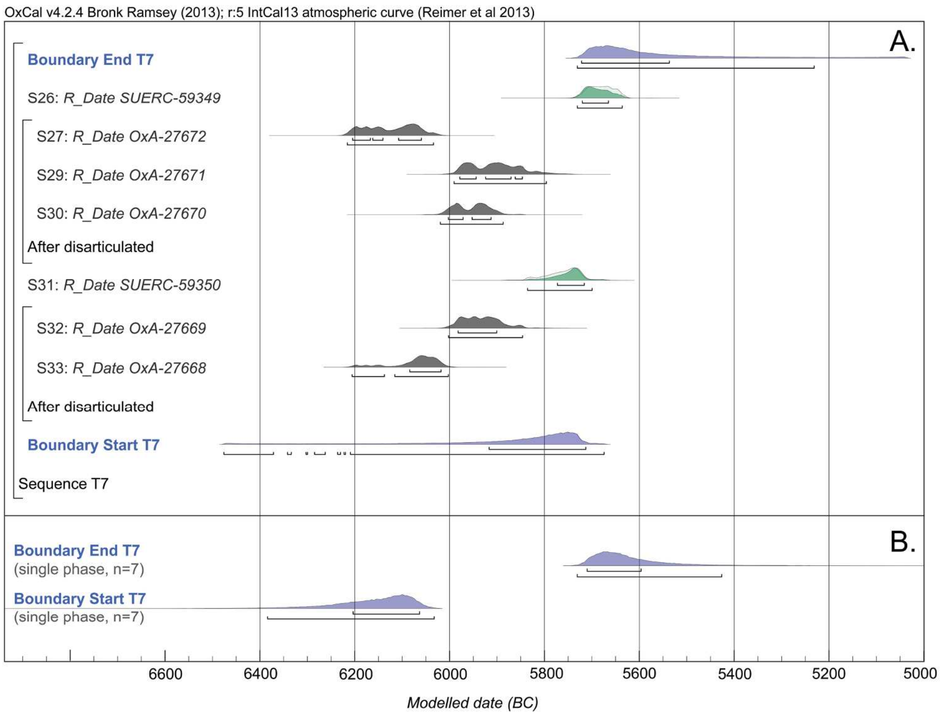

Figure 7: radiocarbon results from Trench 7 at Çatalhöyük West.

101x76mm (600 x 600 DPI)

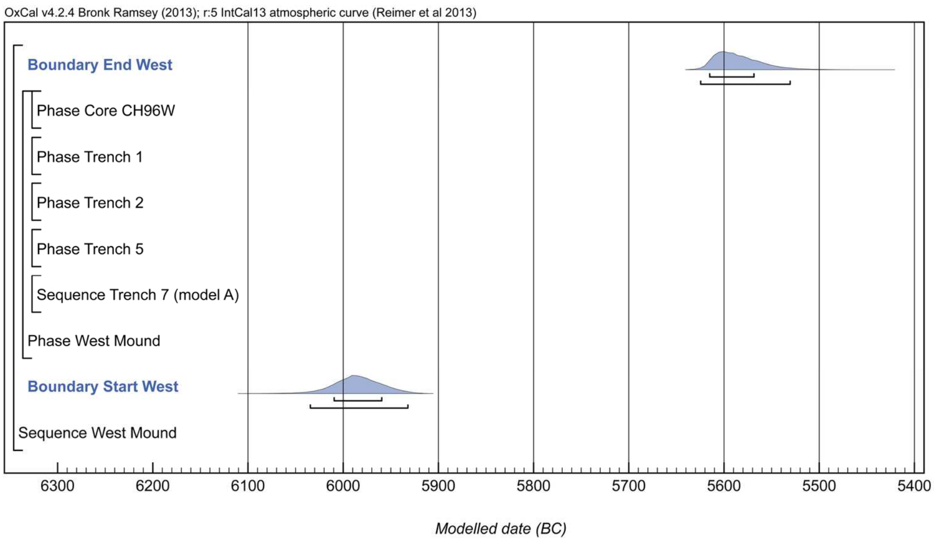

Figure 8: overall chronological model for occupation at Çatalhöyük West, showing estimated start and end dates. Nb. does not account for unexcavated deposits.

77x44mm (600 x 600 DPI)

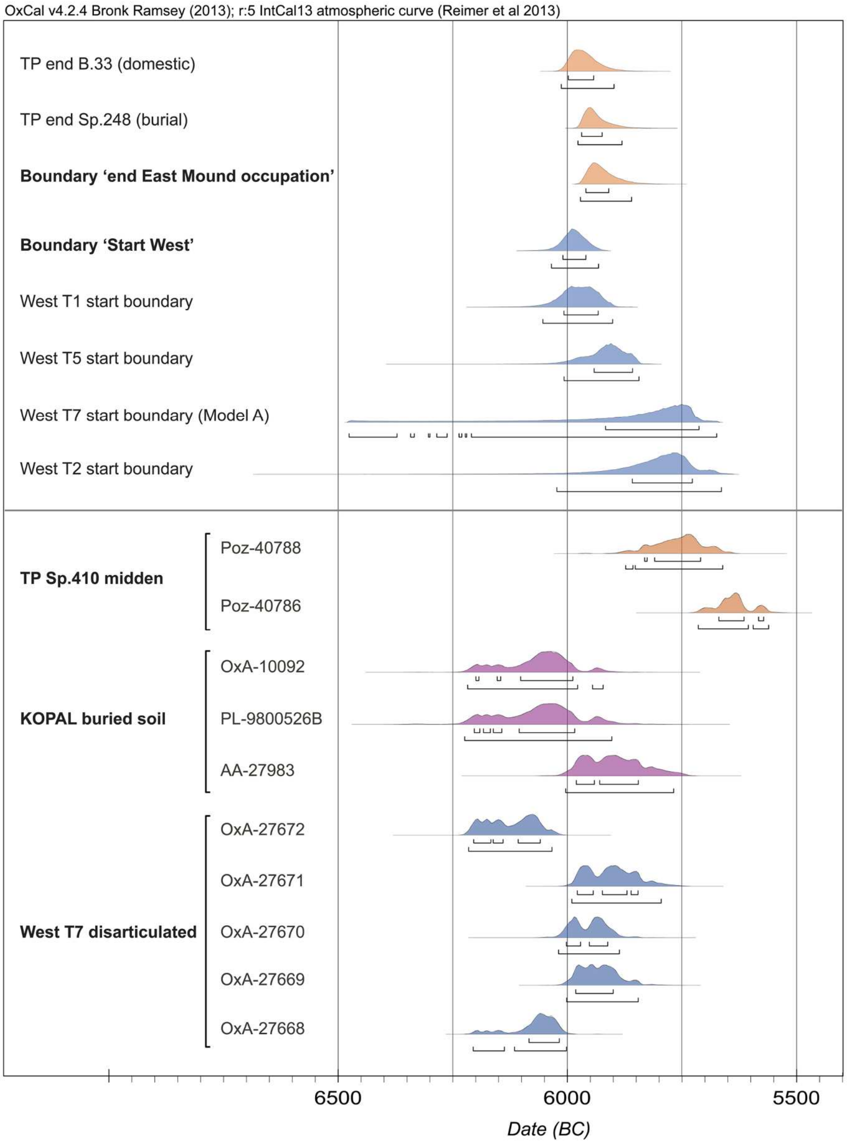

Figure 9: estimated end dates for Çatalhöyük East (Marciniak et al. 2015) and start dates for Çatalhöyük West, plus selected un-modelled dates.

83x107mm (600 x 600 DPI)

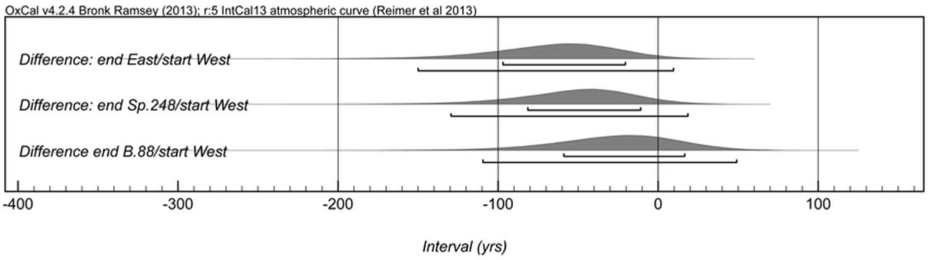

Figure 10: intervals between estimated start date for Çatalhöyük West and end dates for: (1) all East Mound occupation; (2) the last burial chamber in the TP area, and (3) the last domestic structure in the TP area. Negative numbers indicate overlap; positive numbers hiatus. Nb. does not account for unexcavated deposits.

39x11mm (600 x 600 DPI)

A tale of two tells: supplemental information

1. West Mound overall model (this paper) compared with East Mound Area TP model (reconstructed from Table 1 and Figure 2 in Marciniak et al. 2015).
Modelled dates/intervals included in Figures 9 and 10 are shown in boldface.

```
Plot( )
{
 Sequence( "West Mound")
 {
  Boundary( "Start West")
  {
   color="blue";
  };
  Phase( "West Mound")
  {
   Sequence("Trench 7 (model B)")
   {
    After("disarticulated")
    {
     R_Date("OxA-27668", 7205, 36);
     R_Date("OxA-27669", 7043, 36);
    };
    R_Date("SUERC-59350", 6877, 32);
    After("disarticulated")
    {
     R_Date("OxA-27670", 7074, 36);
     R_Date("OxA-27671", 7013, 40);
     R_Date("OxA-27672", 7247, 36);
    };
    R_Date("SUERC-59349", 6782, 34);
   };
   Phase("Trench 5")
   {
    Sequence("B.125/98")
    {
     Phase("B.125")
     {
      R_Date("OxA-29615", 7007, 36);
     };
     Phase("B.98")
     {
      R_Date("OxA-29614", 6944, 36);
      R_Date("OxA-29613", 6912, 36);
     };
    };
    Sequence( B.106)
    {
```

```
 Phase("15365")
 {
  R_Date("OxA-27666", 6992, 36);
  R_Date("OxA-27665", 6966, 37);
 };
 Phase("B.106 upper fill")
 {
  R_Combine( Sample29)
  {
   R_Date("OxA-27663", 6918, 38);
   R_Date("OxA-27664", 6941, 37);
  };
  R_Date("OxA-27662", 6950, 36);
 };
};
Phase("B.105")
{
 R_Date("OxA-27667", 7059, 37);
 R_Date("OxA-27744", 6986, 36);
};
};
Phase( "Trench 2")
{
 R_Date("OxA-11760", 6904, 39);
 R_Date("OxA-11761", 6730, 40);
 R_Date("OxA-11764", 6707, 38);
 R_Date("OxA-11762", 6662, 38);
 R_Date("OxA-11763", 6626, 36);
};
Phase( "Trench 1")
{
 R_Date("OxA-11757", 7103, 39);
 R_Date("OxA-11751", 7070, 45);
 R_Date("OxA-11750", 7065, 40);
 R_Date("OxA-11755", 7049, 39);
 R_Date("OxA-11759", 7028, 39);
 R_Date("OxA-11758", 7028, 37);
 R_Date("OxA-12089", 6990, 40);
 R_Date("OxA-11774", 6969, 36);
 R_Date("OxA-11754", 6945, 39);
 R_Date("OxA-11756", 6937, 38);
 R_Date("OxA-11773", 6915, 34);
};
Phase("Core CH96W")
{
 R_Date("AA-27981", 7040, 40);
 R_Date("PL-980524A", 6940, 80);
};
```

```
  };
  Boundary( "End West");
 };
 Sequence("TP Neolithic")
 {
  Boundary("start TP Neolithic");
  Phase("TP Neolithic")
  {
   Sequence("TP_spine")
   {
    Phase("B.81")
    {
     R_Date("UCIAMS-96505", 7430, 25);
    };
    Date("end B.81/start Sp. 420");
    Phase("Sp.420")
    {
     R_Date("Poz-40795", 7380, 60);
    };
    Date("end Sp.420/start B.74");
    After("B.74")
    {
    };
    Date("end_B.74/start_B.72");
    Phase("B.72")
    {
     After("F.2867")
     {
      R_Date("Poz-24012", 7270, 50);
     };
     Sequence()
     {
      Phase("F.2888")
      {
       R_Date("Poz-40782", 7360, 50);
       R_Date("UCIAMS-96506", 7350, 25);
      };
      Phase()
      {
       R_Date("Poz-40796", 7310, 50);
       Sequence()
       {
        Phase()
        {
         Phase("F.3182")
         {
          R_Date("Poz-40784", 7450, 50);
          R_Date("UCIAMS-96508", 7405, 25);
```

```
     };
     After("F.3141; unidentified charcoal")
     {
      R_Date("Poz-24009", 7700, 50);
     };
    };
    Phase("F.1940")
    {
     R_Date("Poz-40785", 7410, 50);
     R_Date("Poz-19007", 7440, 50);
     R_Date("UCIAMS-96509", 7430, 30);
    };
   };
  };
 };
};
Date("end B.72/start Sp.327");
Phase("Sp.327")
{
 R_Date("Poz-40793", 7250, 50);
 R_Date("Poz-40794", 7250, 50);
};
Date("end Sp.327/start B.73");
Phase("B.73")
{
 Phase("F.2854")
 {
  R_Date("UCIAMS-96507", 7310, 35);
  After("residual")
  {
   R_Date("Poz-40783", 7460, 50);
  };
 };
 Phase("F.1943")
 {
  R_Date("UCIAMS-96510", 7335, 25);
 };
};
Date("end B.73/start B.62");
After("B.62")
{
 R_Date("Poz-19006", 7280, 50);
 R_Date("UCIAMS-96511", 7445, 30);
 R_Date("Poz-19005", 7460, 50);
};
Date("end B.62/start B.61");
Sequence("B.61.1")
{
```

```
 After("F.3132; unidentified charcoal")
 {
  R_Date("Poz-13573", 7620, 50);
  R_Date("Poz-19004", 7450, 50);
 };
 After("unidentified charcoal")
 {
  R_Date("Poz-19001", 7430, 50);
 };
 Phase("F.1938")
 {
  R_Date("UCIAMS-96512", 7295, 25);
  After("residual")
  {
   R_Date("Poz-40789", 7450, 50);
  };
 };
};
Sequence("B.61.3")
{
 After("F.3135; unidentified charcoal")
 {
  R_Date("Poz-13571", 7390, 40);
  R_Date("Poz-19002", 7460, 70);
 };
 Phase()
 {
  After("After F.1916; unidentified charcoal")
  {
   R_Date("Poz-13696", 7530, 50);
  };
  Phase("F.1918")
  {
   R_Date("Poz-40790", 7290, 50);
   R_Date("UCIAMS-96513", 7300, 25);
   R_Date("Poz-40792", 7270, 50);
   R_Date("UCIAMS-96514", 7335, 30);
  };
 };
};
Date("end B.61/start Sp.248");
Phase("Sp.428")
{
 R_Date("Poz-13700", 7150, 50);
 Phase("articulated")
 {
  R_Date("UCIAMS-113462", 7025, 20);
  R_Date("UCIAMS-113461", 7175, 20);
```

```
  };
  After("disarticulated")
  {
   R_Date("Poz-13659", 7090, 50);
   R_Date("Poz-19104", 6990, 40);
   R_Date("Poz-19075", 7180, 40);
  };
 };
 Date("end Sp.248 (burial)")
 {
  color="orange";
 };
};
Sequence("TP 2nd string")
{
 Phase("Sp.439")
 {
  R_Date("UCIAMS-113459", 7265, 25);
 };
 After("Sp.431")
 {
  R_Date("Poz-18999", 7183, 55);
 };
 After("Sp.414")
 {
  R_Date("Poz-7451", 7190, 40);
  R_Date("Poz-7452", 7360, 50);
 };
 Phase("Sp.412")
 {
  R_Date("UCIAMS-113460", 7130, 20);
 };
 Date("end Sp.412/start B.33");
 Phase("B.33")
 {
  R_Combine("7878")
  {
   R_Date("Poz-7449", 7100, 50);
   R_Date("UCIAMS-113463", 7145, 20);
  };
  After("unidentified charcoal")
  {
   R_Date("Poz-7450", 7210, 50);
  };
 };
 Date("end B.33 (domestic)")
 {
  color="orange";
```

```
   };
  };
 };
 Boundary("end East Mound occupation")
 {
  color="orange";
 };
 Phase("Sp.410")
 {
  R_Date("Poz-40788", 6870, 50)
  {
   color="orange";
  };
  R_Date("Poz-40786", 6720, 40)
  {
   color="orange";
  };
 };
};
Difference("end East/start West", "Start West", "end East Mound occupation");
Difference("end Sp.248/start West", "Start West", "end Sp.248");
Difference("end B.88/start West", "Start West", "end B.33");
};
```

2. Trench 7, model A

```
Plot()
{
 Sequence( T1)
 {
  Boundary( StartT7);
  Phase( T7)
  {
   R_Date("OxA-27668", 7205, 36);
   R_Date("OxA-27669", 7043, 36);
   R_Date("OxA-27670", 7074, 36);
   R_Date("SUERC-59350", 6877, 32);
   R_Date("OxA-27671", 7013, 40);
   R_Date("OxA-27672", 7247, 36);
   R_Date("SUERC-59349", 6782, 34);
  };
  Boundary( EndT7);
 };
};
```