Neolithisation process in the central Zagros: Asiab and Ganj Dareh revisited

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ABSTRACT – *In the 1960–70s, fieldwork in the central Zagros Mountains produced evidence of early Holocene Neolithic settlements in this mountainous zone along the 'Eastern wing' of the Fertile Crescent. Following a long hiatus in fieldwork, new investigations have highlighted once more the potential of the transitional Neolithic (*c. *9600–8000 BC) and early Neolithic (*c. *8000–7000 BC) sequence in this region. However, some of the pivotal sites that had originally been excavated in the 1960–70s were not published in adequate detail, leaving many questions unanswered. Recent fieldwork at Asiab and Ganj Dareh directed by the authors has sought to address the issues raised by these previously unpublished excavations. Here we summarise the results of our recent work at these two sites and discuss their implications for our understanding of neolithisation in the central Zagros.*

KEY WORDS – *Zagros; neolithisation; Asiab; Ganj Dareh; early domestication*

Proces neolitizacije v osrednjem delu Zagrosa: ponovni pregled najdišč Asiab in Ganj Dareh

IZVLEČEK – *Izkopavanja v 60. in 70. letih 20. stoletja v osrednjem delu gorovja Zagros, t.j. v goratem predelu na vzhodnem kraku rodovitnega polmeseca, so odkrila zgodnje holocenske neolitske naselbine. Po daljši prekinitvi so nove raziskave ponovno izpostavile potenciale za preučevanje obdobja prehodnega neolitika (ok. 9600–8000 pr.n.št.) in zgodnjega neolitika (ok. 8000–7000 pr.n.št.) v tej regiji. Nekatera ključna najdišča, ki so bila prvotno izkopana v 60. in 70. letih 20. stoletja, do danes še niso bila natančno objavljena, zato ostajajo številna vprašanja povezana s temi najdišči še odprta. Avtorji prispevka so želeli z novimi izkopavanji na najdiščih Asiab in Ganj Dareh pridobiti nove podatke in odgovore na nerešena vprašanja iz starejših neobjavljenih raziskav. V prispevku predstavljamo rezultate izkopavanj na obeh najdiščih in razpravljamo o njuni vlogi pri razumevanju procesa neolitizacije v osrednjem Zagrosu.*

KLJUČNE BESEDE – *Zagros; neolitizacija; Asiab; Ganj Dareh; zgodnja domestikacija*

Introduction

Recent debates concerning the development of the Neolithic in southwest Asia have centred on whether plant cultivation and associated cultural characteristics emerged rapidly first in an Upper Euphrates 'core area', and whether this process was driven by environmental, demographic, socio-economic or cultural-symbolic factors. In this regard, it is argued that the eastern wing of the Fertile Crescent, including the central Zagros, was a distinct 'eco-cultural' zone that experienced trajectories different to the western wing, despite some more or less contemporaneous evolutions that it shared with other parts of the Fertile Crescent (*e.g.,* see *Kozłowski, Aurenche 2005; Zeder 2011*). Likewise, recent research

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across southwest Asia has demonstrated the extent of the regional diversity of early cultivator-gatherer-farming societies between the 10th and 8th millennia BC (see *Arranz-Otaegui* et al. *2018; Weide* et al. *2018*). In the eastern wing, early cultivation of key founder crops has been suggested for a number of early Neolithic sites in the central Zagros (see *Riehl* et al. *2012; 2013; 2015*), as well as elsewhere outside the so-called 'Golden Triangle' of the Upper Euphrates and the Levantine corridor (see *Kozłowski, Aurenche 2005; Fuller* et al. *2011; Nesbitt 2002*), calling into question the idea of a single coherent core area of early plant cultivation. This once again highlights the importance of the Zagros region in investigating neolithisation in southwest Asia. Pioneering fieldwork in this region was directed by the late Robert Braidwood in the 1940–50s, he and his team of interdisciplinary specialists investigated early domestication and the emergence of sedentary way of life (see *Braidwood 1961; Braidwood* et al. *1961; 1983*). Unlike his work in Iraqi Kurdistan (*cf. Braidwood, Howe 1960; Braidwood* et al. *1983*) Braidwood's subsequent Iranian Prehistoric Project (IPP) was never fully published. Nevertheless, excavations at Warwasi, Asiab and Sarab laid the foundations for later fieldwork in the Iranian Zagros (Fig. 1). In 1963, Peder Mortensen located aceramic and ceramic Neolithic deposits in a deep trench at Tapeh Guran and then discovered additional Epipalaeolithic and Neolithic sites in the Huleilan Valley during a survey in 1973–74 (*Meldgaard* et al. *1963; Mortensen 1974; 2014*). At the same time, Frank Hole excavated Ali Kosh and Chogha Sefid in the Deh Luran plain (*Hole* et al. *1969; Hole 1977*). The longest fieldwork, however, was directed by Philip E. L. Smith (*1976*) who excavated a large area at Ganj Dareh during five seasons between 1965 and 1974. Levine surveyed the Mahidasht Plain in 1975 (*Levine 1976; Levine, McDonald 1977*) and made a brief sounding at Tapeh Sarab in 1976 (*McDonald 1979*). Both Smith and Mortensen investigated an area between Harsin, Bisotun and the confluence of the Qara Su and Gamasiab rivers in 1977 which was accompanied by sounding at three Neolithic sites (*Mortensen, Smith 1977; Smith, Mortensen 1980*). The latest important excavation, prior to the 1980s, was undertaken by Judith Pullar (*1990*) at Tapeh Abdul Hosein in 1978. Over the following two decades, fieldwork ceased due to regional instability. Although this first phase of fieldwork demonstrated the presence of aceramic Neolithic settlements in the central Zagros, many questions concerning their emergence and development with respect to external versus internal cultural influences, the subsistence

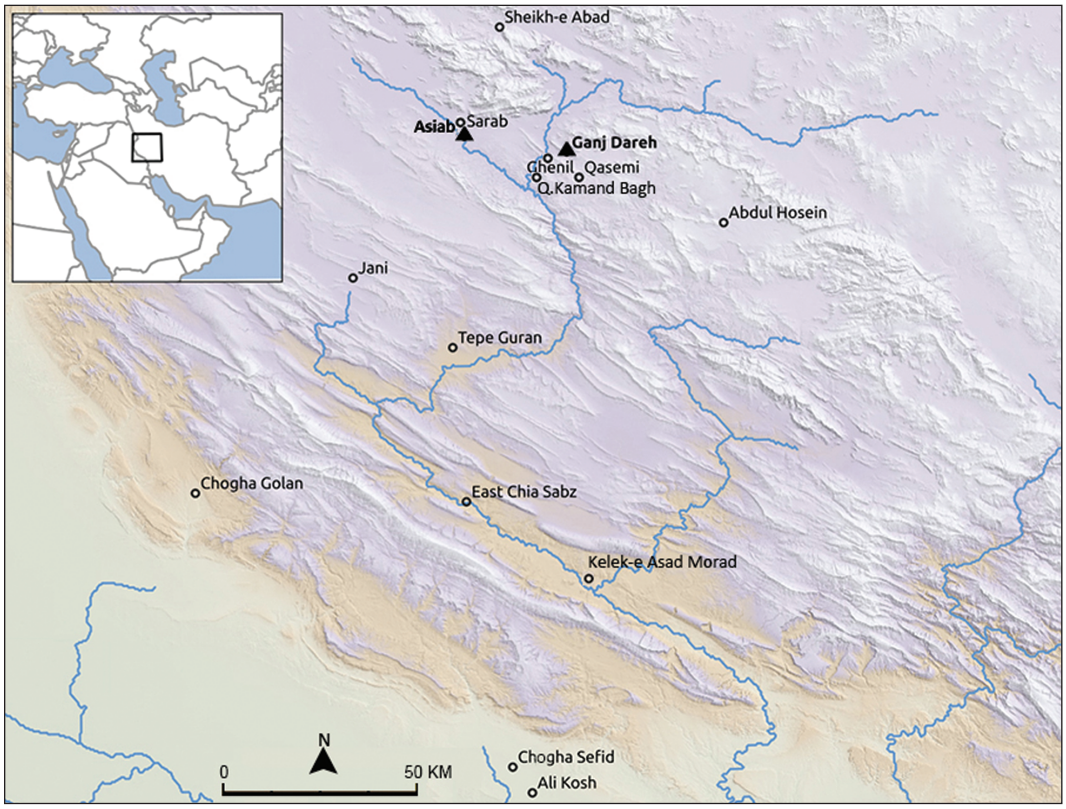

Fig. 1. Map showing the location of the most important Neolithic sites, including Asiab and Ganj Dareh, in the Central Zagros.

economy and settlement pattern, as well as the chronology, were only partially answered or not answered at all.

By the late 2000s new fieldwork projects were initiated in the central Zagros at Sheikh-e Abad (*Matthews* et al. *2013*), East Chia Sabz (*Darabi* et al. *2011; 2013*), Chogha Golan (*Conard* et al. *2013*) and Kelek-e Asad Morad (*Moradi* et al. *2016*). Based on evidence gained from these excavations, discussion on the better understanding of neolithisation in the central Zagros began to emerge (see *Darabi 2015*). Although these recent studies have produced new insights into the emergence of Neolithic economies and societies in this region, some of the previously excavated sites present us with a number of ambiguities, which we will discuss in more detail below. Moreover, most of the sites that have been investigated to date have focused on aceramic or ceramic Neolithic occupations, but very few Epipalaeolithic sites have thus far been investigated. It is for these reasons that a new project entitled "*Tracking Cultural and Environmental Change: The Epipalaeolithic and Neolithic in the Seimarreh Valley, central Zagros*" (TCEC) was initiated in 2016[1]. Following a short introduction of the aims of the new project, this article discusses the preliminary results from the project's new excavations at Asiab and Ganj Dareh, two famous sites originally excavated in the 1960–70s.

TCEC project

Despite recent efforts to investigate the onset of the Neolithic and the nature of neolithisation in the central Zagros, little is known about the preceding late Epipalaeolithic societies that occupied this region prior to the Neolithic. Although previous research had demonstrated that a number of Epipalaeolithic settlements exist in the region (*Braidwood 1960; 1961; Smith 1967; Mortensen 1993; Olszewski 1993a; 1993b*), none of these were comprehensively published, and little is known about the economy, palaeoenvironment or society of these groups. A chronological gap still exists between the late Epipalaeolithic and the early Neolithic in the central Zagros that has to yet be explained, though recent investigations at Sheikh-e Abad and Chogha Golan have pushed backed the emergence of early settlements to the 10th millennium BC (*Matthews* et al. *2013; Riehl* et al. *2013*). It is still unclear whether this gap is due to a genuine absence of late Epipalaeolithic settlement in the region because of the harsh conditions of the Younger Dryas, or if this is simply because of a lack of investigated sites. Recent work at rockshelter and cave sites in the Kermanshah area has only yielded ephemeral evidence for Epipalaeolithic occupations (Heydari-Guran, personal communication, 2017). Thus, the overall objective of the TCEC project is to obtain a better understanding of the role played by the central Zagros in the neolithisation process during the late Pleistocene and early Holocene periods (*c.* 13 500–6000 cal BC). In addition to reconnaissance surveys the project aims to re-investigate some previously excavated sites using small-scale excavations in combination with up-to-date archaeological methods (*e.g.*, high-resolution Accelerator Mass Spectrometry dating, ancient DNA analysis, micromorphology and botanical flotation) that were not available in the 1960–70s. A further goal is to reconstruct the late Pleistocene and early Holocene landscapes in the central Zagros to gain a better understanding of the impact of macro-climatic changes on late Pleistocene and early Holocene communities in the region. Furthermore, the project aims to establish a detailed chronology of the transition from the Epipalaeolithic to the Neolithic in the central Zagros where, unlike its westward neighbours, suffers from a precise chronological frame. In this respect, in the first phase of the project two previously excavated sites were revisited: Asiab and Ganj Dareh.

Asiab

Asiab was first excavated by Bruce Howe under the overall direction of Robert Braidwood in 1960 (*Braidwood 1960; 1961; Braidwood* et al. *1961*). Although Asiab is well-known there is a significant lack of secure knowledge about the site. Since there is no detailed final publication of the excavations very little information is available about the stratigraphy of the site, specific features, the material culture, fauna or botanical remains. The nature of the occupation (short-term versus long-term), the function of the circular cut in the basal layers (refuse pit versus building, see below), the date of the occupation, and the nature of the site's economy – both with respect to animals and plants – is largely based on partial, incomplete reports and little solid data.

1 In 2014, Peder Mortensen and Tobias Richter were asked by the board of the C. L. David Foundation and Collection to look into re-initiating research into the late Epipalaeolithic and early Neolithic in the central Zagros, leading on from Peder Mortensen and Philip Smith's surveys in the Harsin basin during the 1970s (*Smith, Mortensen 1980; Mortensen, Smith 1977*). Subsequently, the current joint Iranian-Danish project was set up.

Fig. 2. A general view of the Pleistocene terrace on which Asiab sits during the 2016 excavation, looking north/northeast.

Flotation for botanical remains was not carried out during the original excavations, as the technique was unknown at the time. The previous absolute dates from Asiab range from 9310–6528 cal BC (*Bangsgaard* et al. *2019*), reflecting a very long range. Given the lack of a published stratigraphic sequence there are great uncertainties over the provenience of the dated samples, in addition to issues surrounding the dating methods used and the type of sample material dated. It is due to these reasons that the TCEC project decided to return to Asiab in 2016 to relocate, re-excavate and record Bruce Howe's 1960 excavation area, and to open up a new area to obtain stratified finds and samples from the site. A particular focus was on the recovery of charred plant materials, as the original excavations did not sample for this particular material, whereas it is now of vital importance to reconstruct ancient environmental regimes and plant-based subsistence (*Darabi* et al. *2018*).

The site of Asiab is located at 1304m a. s. l. on the east side of the Qara Su river, *c.* 0.5km south of the village of Bijaneh and 0.7km from the modern outskirts of Kermanshah (Fig. 2). It is situated on a Pleistocene river terrace, which is now *c.* 5m above the current floodplain of the Qara Su River. While no plan of the excavation areas or trenches was published, Howe states in one of the only more detailed descriptions of the excavation that 130m² of the site were exposed in a series of smaller and larger trenches and areas (*Howe 1983*). The largest excavation area measured 6 x 8m. At the base of this main area Howe exposed one quarter of a circular feature that had been excavated into the virgin soil during the Neolithic. In the interior of this feature he discovered numerous pits and two human burials (*Howe 1983*). In this report, the stratigraphy was only described in very basic terms and Howe voiced uncertainty over the interpretation of the circular feature he had exposed, calling it either the remains of a building or a refuse pit.

In 2016, the priority was to relocate the previous main excavation area that Howe dug in 1960. Three areas were opened up: Area I on the northern part of the terrace, Area II at the western edge of the terrace and Area III in the central part of the terrace (Fig. 3). While Area I yielded no significant archaeological features, Area II was a narrow trench excavated to better understand the stratigraphy of the sediment above the conglomerate that forms the Pleistocene terrace. Area III became the main focus of our excavations. This area was laid out to measure 15 x 15m, and after removing topsoil the infilled excavation area of Bruce Howe from 1960 became visible. Following the removal of the backfill, which was dry-sieved on site, the feature previously reported by Howe was once again revealed (Fig. 4). The circular feature was associated with a number of postholes and pits that Howe seems to have excavated back in 1960. In the northeast of the Howe area excavations revealed a pit that was not excavated or simply missed during the original excavation. This pit contained skulls and mandibles of 19 wild boars, as well as a single deer antler and the cranium of an Asiatic brown bear (*Bangsgaard* et al. *2019*). The 19 boar skulls and mandibles were all aligned in an east-west orientation and tightly packed together. They were clearly placed in the pit in this fashion intentionally with convincing symbolic connotations. The pit was sealed with the spoil from its excavation and appears to have been immediately buried after the placement had been made.

A succession of two floor layers, which Howe did not report in any of the publications, were recorded in both the north and east section of the area. Their presence together with the numerous postholes clearly suggest that the circular feature is the remnant of a Neolithic building. It is important to note that both in this area, and in the newly established excavation area adjacent to it (see below), there was considerable evidence for bioturbation: vertical 'shafts' disturbing the archaeological sequence were noticeable in the sections. These shafts led into animal burrows that crisscrossed Howe's area, as well as the new excavation area. This suggests considerable disturbance in the Asiab stratigraphic sequence.

To further expose this structure, and also to recover *in situ* archaeological remains, a 5 x 5m excavation was opened next to Howe's area (Fig. 5). In this area the circular feature continued, but we were able to trace it from much higher in the sequence. The feature became visible immediately beneath the plough zone horizon. Further excavation showed that the feature was cut into the sub-soil to a depth of 1.2m, whereas in Howe's 1960 area the cut was only preserved to a height of *c*. 0.3m. This suggests that Howe did not notice the feature immediately and did not trace its contour, but truncated the upper 0.9–1m of it. Our excavation in the new area showed that the feature was infilled by a substantial midden deposit which, as previously noted, was heavily disturbed by animal burrows. These burrows continued all the way down to the floor of the structure, where we found a series of collapsed animal tunnels crisscrossing the floor of the structure. Along the edge of the sunken feature a pisé bench or wall had been built that followed the circular shape of the cut. We therefore believe that the circular cut is a 'construction cut' into which a wall made of pisé and potentially other materials had been set. Some antlers were incorporated into the pisé feature. Inside the structure we found the remnants of a mud-plaster floor, confirming the observation from the north and east sections in Howe's area. In one area a shallow depression had been shaped in the floor, painted with red pigment (presumably ochre), and a cattle horn core placed inside.

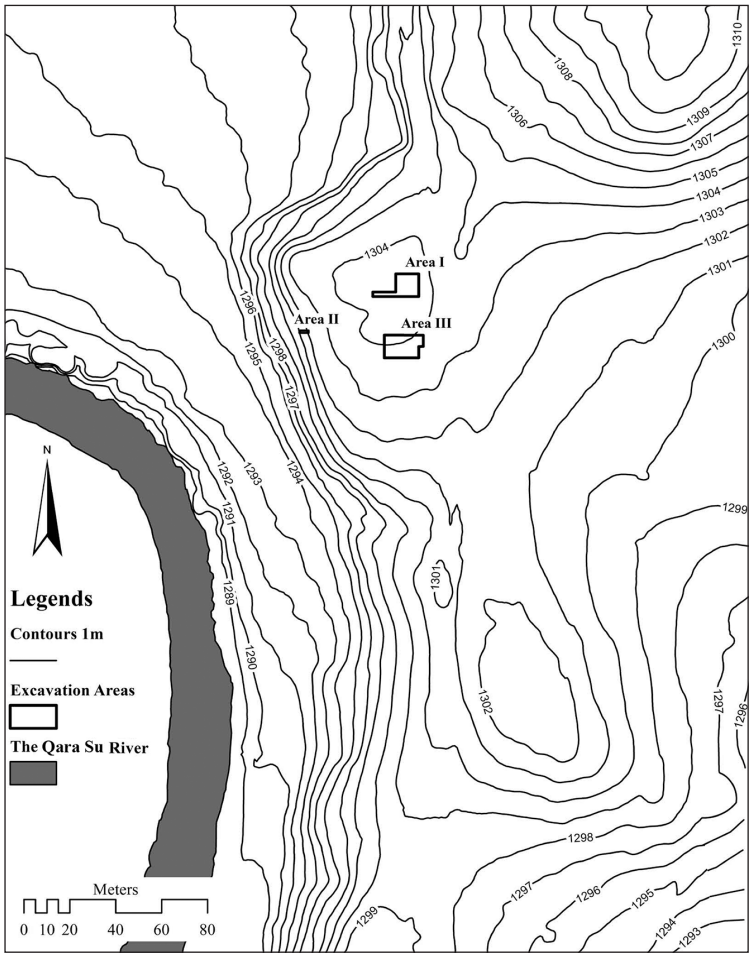

Fig. 3. Counter map of the site and the surrounding area showing the location of excavation areas in 2016.

The discovery of post- and stakeholes, as well as *in situ* floors inside the circular feature demonstrates that this was indeed a (semi)subterranean, sunken building of considerable dimensions. This building may have had a 'special' character: its considerable size measuring 10m in diameter, the pit with dozens of placed wild boar skulls, caches of antlers, as well as the single horn core placed in a plastered depression stained with ochre, all suggest that this building may have had a ceremonial, symbolic or communal function.

The lithic assemblage recovered from the excavation is quite homogenous. Cores are mostly uni-directional single platform bladelet and flake samples, with some opposed platform cores and flake cores also present. Bladelets and flakes are most common, while blades are much fewer in quantity. Amongst the retouched pieces, backed, utilized and retouched bladelets are common, as well as retouched blades. Techno-typologically, these criteria suggest that the Asiab assemblage can be grouped under the

'Pre-M'lefatian industry', a transitional lithic tradition that links the preceding Zarzian to succeeding early M'lefatian tradition.

Faunal material analysed to date provides evidence for a variation of species, including *Caprines*, boar, aurochs, rodents, hedgehog, birds, tortoise, crab and fish. At present there is no evidence of animal management (*Bansgaard* et al. *2019*), although analysis of the faunal material continues. The preliminary analyses of the plant macroremains indicates the predominance of small-seeded grasses (*Poaceae*), which are found in >90 of the samples. Medium and large-seeded grasses like wild oat, feather-grass, medusahead, and brome are also present, as well as wild barley and wheat. Amongst the wild plants there are some edible species like club-rush, along with crucifers and *polygonaceae*. Despite the presence of plants commonly considered as 'weeds of cultivated crops' there is no firm evidence for plant cultivation at the site. The wood charcoal recovered from the excavations suggests the presence of woodland-steppe vegetation with pistachio and almond.

Nine new Accelerator Mass Spectrometry dates are now available from Asiab, which allow us to evaluate some of the previous dates obtained from the site. Howe (*1983*) obtained four dates from Asiab which placed the occupation between *c*. 9300–7600 cal BC (68.2% probability). However, these dates are suspect because their proveniences are unknown, the sample material is unspecified and bulk radiocarbon dating was used. A second round of dates obtained from collagen samples of animal bones from the 1960 excavation by Melinda Zeder and Brian Hesse (*2000; Zeder 2008*) using Accelerator Mass Spectrometry dating produced dates falling between *c*. 9120–6530 cal BC (68.2% probability). Our new series of nine dates, however, produced a range falling between *c*. 9750–9300 cal BC (68.2%). All of these dates were obtained from point provenienced samples of charred plant matter that was identified to species or, if identification was not possible, only short-lived parts of plants were selected. Our new dates clearly indicate that the occupation of Asiab fell into the earliest part of the Holocene, right at the conventional start of the Neolithic era.

Ganj Dareh

Ganj Dareh is situated *c*. 8km west of the city of Harsin in the Kermanshah province, *c*. 32km east of Asiab at an altitude of 1400m a.s.l. The mound is in a small side valley where a small stream has forged a passage through the Deraz Kouh and Boreh Kouh Mountains. In fact, the valley in which the site lies is the only natural break or passage through the mountain range for several kilometres in a northwest-sout-

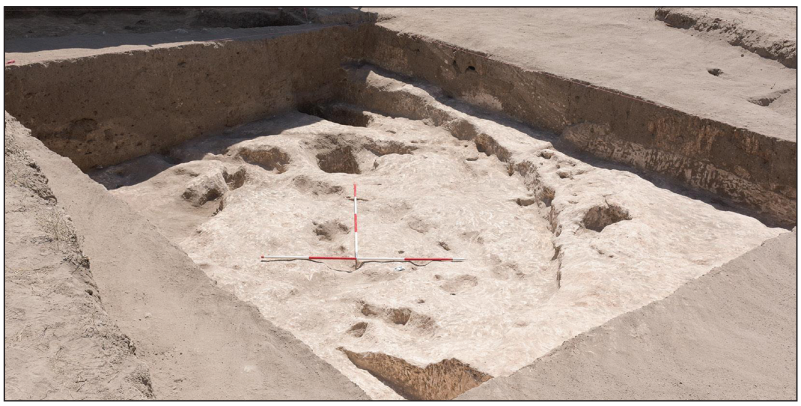

Fig. 4. Braidwood/Howe's trench after the removal of the fill of the original excavation, looking southeast.

Fig. 5. The newly excavated part of the large construction in which remnants of pisé wall, floor, antler and horn core are seen* in situ*, looking south.

heast direction. Ganj Dareh is a settlement mound that rises *c.* 6m above an alluvial floodplain situated between steeply rising limestone cliffs (Fig. 6). The availability of local chert, fresh water and fertile soil as well as suitability of the valley for hunting offered an environmental niche that seems to have been an attractive settlement location. Smith's excavations at Ganj Dareh concentrated on the central, southern and western parts of the mound, exposing approx. 21% of the site (Fig. 7). Smith sub-divided the stratigraphy of the site into five major levels: A, B, C, D and E (from top to bottom). Despite these substantial excavations, however, the results were only preliminarily and briefly published in a series of reports and articles (see *Smith 1967, 1968a-b; 1970; 1971; 1972a-b; 1972b; 1974, 1975; 1976; 1978; 1983; 1990*). Although subsequent analyses of the animal and human bones added to our knowledge in association with chronology and the issue of initial herding of goats at the site (see *Zeder 1999; Zeder, Hesse 2000; Meiklejohn* et al. *2017*) the lack of a final, comprehensive report left many questions unanswered. These include questions about the chronology of the site, the changes in architecture and evidence for plant cultivation. Therefore, the general objectives of the TCEC project were to re-investigate the chronology, questions about sedentism, goat domestication, pre-domestic cultivation, pottery emergence and delineation of the site limit (see *Darabi* et al. *2017*).

In 2017, work concentrated on an area to the north of Smith's central excavation. The section that remained from the original excavations was first cleaned and recorded. In order to study the full stratigraphic sequence of the mound a 9m long and 3m wide trench was opened, targeted over the top of the mound and the collapsed/backfilled main area of Smith's excavation. The area was labelled Area A and subdivided into A1 (top part of the trench) and A2 (lower part of the trench) (Fig. 8). The overall goal was to record the entire stratigraphic sequence in a stepped trench. In A1 our excavations targeted Smith's levels A-C, which had not been well described in the existing reports of the excavations. Our work revealed solid remains of pisé and mud-brick walls in the upper levels suggesting the presence of a number of distinct buildings. This contrasts with Smith's assessment of Levels A-C, which he described as being largely unclear. Area A2 targeted Smith's earlier levels D-E. Around two meters of archaeological deposits were excavated in this area. Most of the burned deposit between the two areas was left unexcavated until the following season in 2018. A new area (Area B) was opened to the west of the mound adjacent to the location of the so-called West Cut, where Smith had found pits that he attributed to Level E. Our aim in opening this area was to determine the chronological relationship between the pits found by Smith and the lowest phase in Area A. Excavations in Area B, which measured 2 x 2m resulted in the discovery of architectural remains that appeared to be linked, on the basis of material culture recovered, to the upper phases A-C on the mound. Moreover, in order to delineate the site, 17 test pits were dug around it. The delineation showed that the original limit of Ganj Dareh was *c.* 0.7ha, much larger than what had previously been thought, *i.e.* 1300m^2 (*cf. Smith 1972b.183; 1975. 179*).

In 2018, the unexcavated portion between Areas A1 and A2 was focused on to establish a stratigraphic link between the upper and lower sequence. The majority of the archaeological remains excavated here can be correlated with Smith's Level D. They appear to have been burned at a high temperature, which turned the deposit into a reddish-brown in colour. In fact, the burned deposit is entirely composed of building materials, including plastered floors and walls built of pisé and mud-bricks. As no

Fig. 6. Arial view of Ganj Dareh and the surrounding lime outcrops (photo by L. Ahamdzadeh).

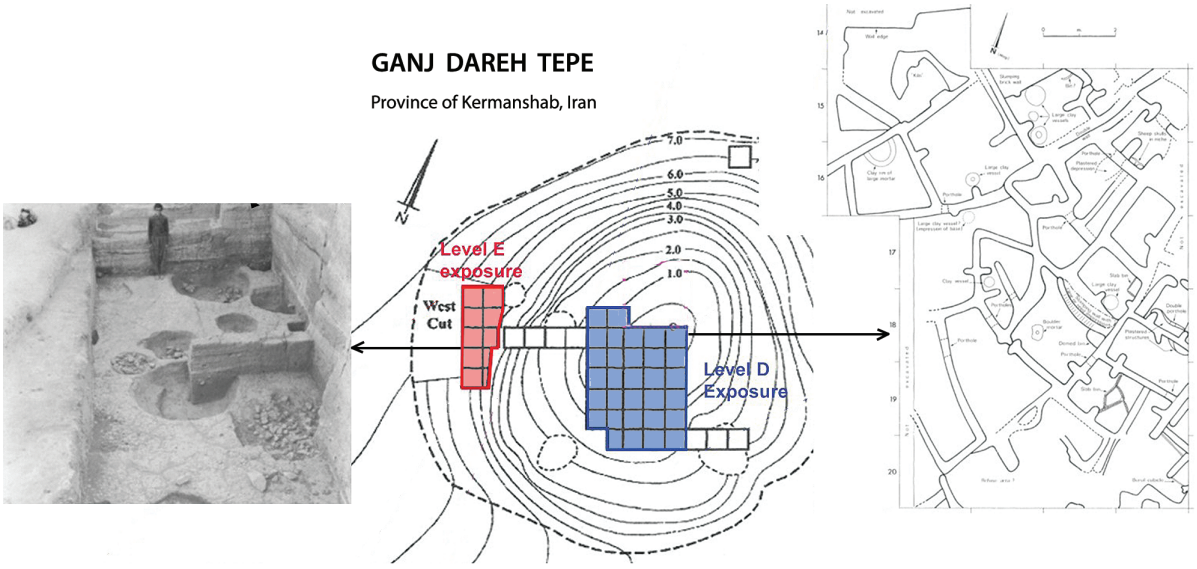

Fig. 7. Locations of the excavated areas in the 1960–70s; note the pits (level E) exposed in the west cut and plan of the buildings (Level D) in the central part of the mound (modified after* Merret 2004.178, Fig. 9/1*).

solid evidence of the Level E had been exposed in the 2017 season, a new excavation area (Area D), 4 x 4m in size, was targeted over the north edge of the 'West Cut'. In addition to relocating the eastern border of Smith's 'West Cut', we were also able to document a sequence of *in situ* archaeological deposits overlying Level E (Fig. 9). This included a series of architectural remains not previously reported by Smith. However, the most important find was the exposure of the pits excavated by Smith that he identified as Level E. Some of these pits had not been fully excavated by Smith and provided a unique opportunity to sample for finds, as well as samples for radiocarbon dating. These pits were cut into the virgin soil and it is still unclear whether they consist of the earliest remains of the site, as believed by Smith, or are associated with later levels.

The chipped stones of Ganj Dareh that were recovered from previous excavations have already been analysed (see *Nishiaki 2016; Thomalsky 2016*). Our own analysis of the material recovered in 2017 and 2018 shows that the predominant raw material used for flaking is of local origin, namely radiolarian chert, mostly of a reddish-brown colour. The industry is characterised by the predominance of nibbled tools. Subsequently, backed, retouched and notched pieces and scrapers are present. Tool production was predominantly geared towards informal tool types, with a significant presence of microlithic backed bladelet types. The Ganj Dareh lithic assemblage falls into the general Early M'lefatian Kermanshah group (*Kozłowski 1994; 1999; Nishiaki 2016*), and appears quite similar to the East Chia Sabz assemblage recently reported in detail (*Nishiaki, Darabi 2018*).

Zooarchaeological analysis shows that the mammal species were dominated by goats. Other species include wild aurochs, deer, boar, fox and hare. Work on avifaunal remains is still ongoing, but partridges are well represented (*Bansgaard, Yeomans in prep.*). Previous work on the faunal material from the original excavations at Ganj Dareh suggested that goats were managed at the site as an early stage in the aceramic Neolithic (*cf. Hesse 1978; Zeder, Hesse 2000; Zeder 2008*). The preliminary data thus far available from the recent excavations suggests that – on the basis of the mortality profile – there is a high presence of foetal or pullus age bones. This may underline the argument for early goat management. Moreover, mud-bricks with impressed hoof prints also suggest the presence of goats at the settlement during construction work, further supporting the idea of management.

The preliminary analyses of the plant macro-remains from Ganj Dareh was carried out in the latest phases: A-C (no remains from the pits have been analysed yet). In comparison to Asiab, a change is observed with the predominance of large-seeded grasses, primarily barley. However, feathergrass seem to have been consumed as well as the seeds appear fragmented. Lentils are also present, along with small-seeded legumes that could potentially constitute fodder remains. In terms of wood charcoal, woodland-steppe vegetation with pistachio and almond

predominates the assemblage (*Arranz-Otaegui in prep.*).

Ganj Dareh has so far been radiocarbon dated in several stages. First, all of the dates acquired by Smith (*1990*) relied on charred plant material and range from *c.* 10 500–7000 cal BC. However, the dates are not internally consistent. Smith reported that "*the earliest level (E) has produced both the earliest and some of the youngest dates in the site*" (*Smith 1990. 324*). Other samples have also produced dates that appear to be inconsistent with their stratigraphic position. The exact provenance of many of these dates is uncertain. Furthermore, most were obtained using bulk carbon dating and in most cases the dated material was not identified prior to dating. Second, Zeder and Hesse (*2000*) obtained an additional series of 12 AMS dates taken from collagen samples of goat bones from the site ranging from *c.* 8240–7610 cal BC. These dates suggested a much shorter period of occupation for the site. They argued that the site was only occupied for a period of 100–200 years. These dates also showed no hiatus in occupation between Levels E and D. Third, Christopher Meiklejohn *et al.* (*2017*) recently obtained another five dates from collagen in human bones that fall between *c.* 8200–7750 cal BC, confirming Zeder and Hesse's chronology. The real issue for all of these dates, however, is that due to the lack of a final publication the contextual stratigraphic information is non-existent. Thus, all of the dates are somewhat suspect. This makes it vital that additional dates from secure, well-identified and recorded, stratified contexts are obtained, using the latest advanced AMS dating techniques available. We recovered a new series of samples from Areas A and B and some of the test pits dug around the site for delineation in 2017. These were recently dated at the Aarhus AMS Centre and suggest a range of dates between 8200–7600 cal BC (68.2% probability). However, this sequence of dates is not yet complete, as the portion of the stratigraphic sequence between A1 and A2 has yet to be dated, and because no dates are yet available for Area D. However, the dates do show that the occupation in Area B corresponds to Levels A-C at the top of the mound. This suggests that during this phase, between *c.* 7800–7600 cal BC, the occupation spread from the mound to the surrounding area. Further analysis of the recently recovered samples from Ganj Dareh is underway to finalise the chronological assessment of the site.

Fig. 8. A general view of Areas I and II.

Conclusions

The recent excavations at Asiab and Ganj Dareh have started to provide us with significant new insights into the transition from hunting and gathering to agriculture in the central Zagros. However, current achievements are still preliminary and require further detailed analysis. At Asiab, Bruce Howe's main trench was relocated and documented. Moreover, the new excavation area suggests that the cut was originally a circular, semi-subterranean structure that probably represent a communal building – a type of structure that is common at many other early aceramic Neolithic sites in southwest Asia. Judging from new AMS dates it can be stated that the emergence of communal buildings pre-dates the emergence of early domesticates in the eastern wing of the Fertile Crescent. As such, neolithization in the central Zagros should not entirely be limited to an investigation of early domestication and sedentary life while, despite the Levant and Anatolia, other ritual and social dimensions of the life of communities have obviously been overlooked at a regional scale. However, unlike previous views suggesting the initial management of goats at Asiab (*cf. Bökönyi 1977; Zeder*

Fig. 9. Area D after the removal of the backfill showing the* in situ *deposits, including the previously excavated pits by Smith (foreground) and the recently exposed sequence overlying a number of new pits (background).

2008) new zoo-archaeological analysis shows no evidence of animal management or domestication (*Bansgaard* et al. *2019*). Likewise, no evidence indicating cultivation of plants has yet been found. This type of subsistence strategy is consistent with other contemporaneous sites across the Zagros and Taurus arc, where the earliest settlements were still based on hunting and gathering while turning to sedentary life in the 10th millennium BC when the environment had improved after the end of the Younger Dryas. However, the nature of the transition from seasonality to sedentary life is still poorly understood in the Zagros region. Generally speaking, the new finds from Asiab are all aligned with the Transitional Neolithic period (*c*. 9600–8000 BC) during which the foundations were laid for the subsequent early Neolithic (*c*. 8000–7000 BC) in the central Zagros.

The ambiguities associated with the stratigraphy and chronology at Ganj Dareh, are now being addressed. Due to the complexity of the stratigraphic sequence, however, further radiocarbon dating and analysis of the site formation processes are needed to fully evaluate the previous phasing of Ganj Dareh's occupations. The new stratigraphic sequence will allow us to study diachronic developments in architecture, material culture and economy at the site in unprecedented detail. The middle phase of occupation in Area A, previously known as Level D, appears to have some evidence for large-scale destruction that seems to have been resulted from a massive fire. In terms of chronology, our new results show that the site was continuously under occupation for roughly 600 years (*c*. 8200–7600 BC), a duration longer than what was already suggested (*cf. Zeder, Hesse 2000; Meiklejohn* et al. *2017*). Also, delineation of the site has attested to an area larger than the previous estimation. In this regard, it seems that due to continuous occupation and deposition the site was so raised through time that its surrounding areas were finally prioritised by the latest inhabitants and then abandoned forever around the mid-8th millennium BC, a time in which the earliest occupations appeared in the lowland south-western Iran. Based on the new data, it is believed that the earliest occupants of Ganj Dareh were herding goats. This is consistent with the previous evidence (*cf. Hesse 1978; 1984; Zeder, Hesse 2000; Zeder 2008*). Although the presence of cereals is notable at the site the nature of crop domestication still needs further analysis. Ganj Dareh was already suggested to have yielded early evidence of two-row barley (*Van Zeist* et al. *1984*). The questions of barley domestication and also pre-domestic cultivation of plants, however, need to be given further attention in future. It has recently been suggested that pre-domestic cultivation did not happen across the Zagros region (see *Weide* et al. *2018*). Although this idea once again shows a tendency for the out-modelled issue of diffusion of agriculture stemming from culture-historical concepts, further data is required to investigate the mechanism of transition to early domestication at a local scale. Therefore, the transitional Neolithic sites such as Asiab, Chogha Golan and Sheikh-e Abad should attract particular attention to track synchronous cultural and environmental changes at the dawn of the Holocene era in the Zagros.

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back to contents