ABSOLUTE AND RELATIVE DATING OF HALLAN ÇEMİ TEPESİ

A Master's Thesis

by
ERICA HUGHES

Department of
Archaeology and History of Art
Bilkent University
Ankara
June 2007

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The Institute of Economics and Social Sciences
of
Bilkent University

by

ERICA HUGHES

In Partial Fulfillment of the Requirements for the Degree of
MASTER OF ARTS

in

THE DEPARTMENT OF
ARCHAEOLOGY AND HISTORY OF ART
BİLKENT UNIVERSITY
ANKARA

June 2007

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Archaeology and History of Art.

Dr. Marie-Henriette Gates
Supervisor

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Archaeology and History of Art.

Dr. Thomas Zimmerman
Examining Committee Member

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Archaeology and History of Art.

Dr. Tristan Carter
Examining Committee Member

Approval of the Institute of Economics and Social Sciences

Prof. Erdal Erel
Director

ABSTRACT

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Hughes, Erica

M.A., Department of Archaeology and History of Art

Supervisor: Dr. Marie-Henriette Gates

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This thesis challenges the claim that Hallan Çemi (near Batman in Southeastern Turkey) was occupied during the Epipaleolithic (11th millennium BP). While techno-typological analyses of some objects, chipped stone in particular, appear to place the site's occupation within the 11th millennium, the iconography etched into ground stone and worked bone is too similar to PPNB sites in the Urfa Plain to ignore. The excavator himself has provided various descriptions of the site, from Epipaleolithic to Aceramic Neolithic. This terminological discrepancy reflects not only on the problem of dating Hallan Çemi, but also on the larger issue of how one should describe the prehistory of Southeastern Anatolia. The latter problems are claimed to be the combined product of a) the relatively few sites within the region with which to contextualize Hallan Çemi and construct a local chrono-cultural scheme, and b) the related issue of imposing terminologies from other regions which may not be appropriate for Southeastern Anatolia.

Keywords: Neolithic, Epipaleolithic, Dating, Hallan Çemi

ÖZET

HALLAN ÇEMİ TEPESİ'NİN MUTLAK TARİHLEMESİ
VE GÖRELİ TARİHLEMESİ

Hughes, Erica

Yüksek Lisans, Arkeoloji ve Sanat Tarihsi Bölümü

Tez Yöneticisi: Dr. Marie-Henriette Gates

Haziran 2007

Bu tez, Hallan Çemi sitesinin, Epi-paleolitık dönem boyunca insanlar tarafından kullanıldığı şeklindeki görüşü sorguluyor. Bir taraftan, yontma taş başta olmak üzere, nesnelerin tekno-tipolojik analizi, sitteki insan yerleşimini günümüzden 11 bin yıl önceye tarihliyor gibi gözükürken, diğer taraftan, sürtme taşa ve işlenmiş kemik nesnelere kazınmış ikonografi, Urfa Ovasındaki Çanak-Çömleksiz Neolitik B sitlerinde ikonografilere gözden kaçmayacak kadar yakındır. Kazıyı yapan, sit için Epi-paleolitikten Akeramik Neolitiğe uzanan çeşitli betimlerede bulunmuştur. Bu terminoloji farkı, Halan Çemi'nin tarihlenmesi probleminin yanı sıra, bütün bölgenin tarihöncesinin nasıl betimlenmesi gerektiği biçimindeki daha geniş çaplı bir sorunu yansıtıyor. Bu ikinci sorun şu iki faktörün ürünüdür: a) Halan Çemi'yi bağlamına oturmak ve yerel bir krono-kültürel şema yaratabilmek için bölgede gerekenden az sayıda sitin olması,
b) başka bölgelerden edinilmiş terminolojinin, uygun kuşkulu olduğu halde, bu bölgeye empoze edilmesi.

Anahtar Kelimeler: Neolitik, Epi-Paleolitik, Tarihleme, Hallan Çemi

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CHAPTER 1

INTRODUCTION

The difficulties that scholars face when dating pre-Bronze Age sites are especially exacerbated in Southeast Anatolia. There is no consensus among scholars as regards a single set of labels for the area and often comparative terminologies from discreet regions are used in the stead of terminologies or chronologies derived from a quorum of local sites. This dissonance adds to the already difficult task of determining when an object was created, how long it was used, or when a seed was buried. Both relative and absolute dating methods are suspect the farther back in time one reaches, and creating a chronology of events becomes even more problematic.

Hallan Çemi **[Fig. 1, 2]**, a site near Batman in eastern Turkey, has variously been described as: Epipaleolithic (Rosenberg et. al. 1998: 27); Protoneolithic (Peasnall 2002 : 5); Pre-Pottery Neolithic A (PPNA) (Özdoğan and Balkan-Atlı 1994: 206); and Aceramic Neolithic (Rosenberg 1999: 26).

In order to investigate the dating of Hallan Çemi, I will compare and contrast its idiosyncrasies with those of sites dated to the 11th millennium BP and the 9th millennium BP, the Epipaleolithic and PPNA, respectively.

Site Background

Hallan Çemi Tepesi was identified as an archaeological site by Rosenberg and Togul during the four weeks of the Batman River Survey, conducted in 1990 to identify sites in danger due to a dam project on that river (Rosenberg and Togul 1991: 244). Among the surface samples collected were fragments of incised stone bowls, grinders, pierced stones, as well as triangular microliths, borers and scrapers, more than half of which were obsidian (244). These indicated that the complex Neolithic cultures in Anatolia may have had a local precursor, and thus the site was chosen for excavation (Rosenberg 1991: 117). The small mound, which rises to 4.3 meters on the west bank of the Sason Çayı, covers about 0.7 hectares; of which 425 sq. meters (including baulks) was exposed in 1991 (Rosenberg 1992: 118). Salvage work continued for the next three seasons, with a total of 19 weeks of excavation which ultimately exposed 612 square meters (Peasnall 2000: 136-137). Aceramic Neolithic occupation was exposed between depths of 0.5 and 3 meters (Rosenberg and Redding 2000: 42). A sounding on the south flank of the mound was opened, but no evidence of an aceramic deposit was found (Rosenberg et al. 1995: 3). The Neolithic settlement covers only 0.15 hectares (Kozlowski 2006: 44).

Site Dating

Scholars date prehistory by methods that provide either absolute or relative answers. For prehistoric cultures, absolute dates are attained through physical or chemical investigation. There are three different modes of analysis to attain a relative date: comparison of artifacts or architecture with those of nearby sites; comparison with theoretical models; and provenience. Each of these dating approaches has its own assumptions and each has been applied to the dating of Hallan Çemi.

During the 1991 excavation, five charcoal samples were taken, and at 3 standard deviations, the range of overlap for the two standard-sized samples date between 10,420 and 10,320 BP (8,420 and 8,320 BC) (Rosenberg and Davis 1992: 9). Thus the 11th millennium BP date offered by the excavators.

Techno-typological analysis of chipped stone tools, ground stone pestles and architectural forms were used to confirm the absolute dates from the radiocarbon counts.

Local Context [fig.1]

Hallan Çemi lies within the foothills of the Sason Dağları at an elevation of c. 640 meters (Rosenberg and Peasnall 1998: 196). From this location, several different vertically stratified resources were available: the mountainous highlands, the rolling country downstream, and the forests of the foothills themselves (Peasnall 2000: 134). The Sason Çayı, one of three tributaries of the Batman River, flows about 8 m below the site, while the mountains lie between 5 and10 km away

(Peasnall 2000: 132). These mountains, the Sason Dağları, are part of the southern Taurus range, and reach beyond the timber line. Most precipitation falls during the winter, though the amount varies to the point that irrigation is required for agriculture (Peasnall 2000: 133). The Sason, Hıyan and Ramdenka Çayları empty into the large Batman River about 6 km downstream from Hallan Çemi. The remains of an oak and pistachio forest still exist upon the foothills.

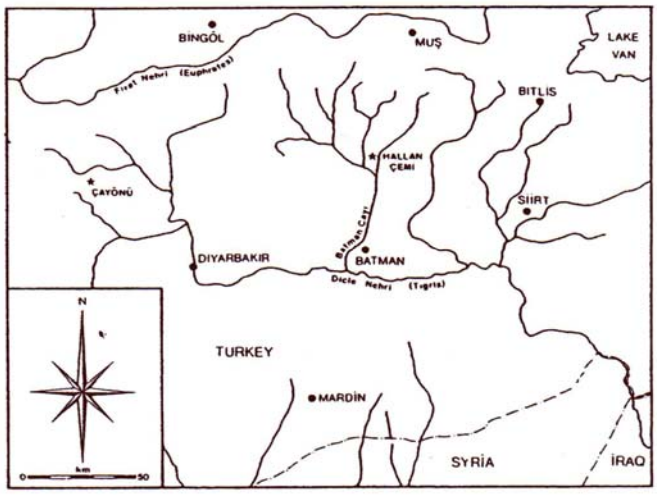

Figure 1 Map of the Upper Tigris drainage showing Hallan Çemi.

Regional Context [fig. 2]

Hallan Çemi, due to its geographical position, is considered part of Upper Mesopotamia on the basis of the fact that it is located on a tributary of the Tigris River. The piedmont region of the Fertile Crescent, where Braidwood expected 'Neolithization' to have begun, includes the foothills and intermontane valleys of Upper Mesopotamia (Braidwood and Howe 1960). More recently, Upper Mesopotamia has been recentered to the Taurus piedmont (Hauptmann 1999: 65).

This larger concept has been divided, on the basis of geomorphological attributes, into five subregions. Two fall along the Euphrates and are less pertinent to the present study, yet the other three areas will be discussed in more, albeit brief, detail in order to provide a basis for comparison.

The Middle Euphrates subregion includes the sites of Mureybet and Abu Hureyra, both of which were settled during the Epipaleolithic Natufian period (12,500-10,000 BC). Abu Hureyra was settled during the 11th millennium BC, as evidenced by numerous pits and post- holes. Settlement at Mureybet began at the end of the Natufian period, around the end of the 11th millennium BC (Akkermans and Schwartz 2003: 29-31). The Natufian is a Levantine cultural assemblage crucial to the origins of the Neolithic (Akkermans and Schwartz 2003: 25).

The Western Zagros Valleys subregion includes the sites of Nemrik 9, M'lefaat and Qermez Dere. These sites in the Iraqi Jezirah are at low altitudes, but nestled within the piedmont region with easy access to higher altitudes.

Qermez Dere lies 50 km west of modern Mosul, on the ecotonal junction of the Iraqi Jezirah and the foothills of the Jebel Sinjar (Peasnall 2000: 399). Six radiocarbon dates from seeds discovered by flotation place the site between 10,000 and 9,500 BP, or the beginning of the Aceramic Neolithic. Relative dating is facilitated by the presence of first Khiam and then Nemrik points (Peasnall 2000: 345).

M'lefaat is located 35 km east of Mosul, just inside the Northern Piedmont zone. Although M'lefaat lies at an altitude of 290 m, peaks of the Zagros reach 1600 m just 55 km to the north (Peasnall 2000: 368). The radiocarbon dates for this

site are a complete jumble, though the accelerator dates were more in touch with the presence of Khiam points, so roughly the first half of the 10th millenium BP.

Nemrik 9 lies 50 km northwest of Mosul, between foothills and plains in the Tigris River valley. The site lies at an altitude of 345 m on the third river terrace, about 70 km from water level (Peasnall 2000: 410). Of an amazing 81 radiocarbon dates published in 1994, more than half were deemed unusable by the excavator, either outside the range of radiocarbon dating or stratigraphically inconsistent. The excavator has suggested that occupation began and ended during the 10th millennium BP (Peasnall 2000: 419).

Epipaleolithic sites of the Zagros region include Zawi Chemi Sanidar, Palegawra, Zarzi and the Shanidar Cave (Kozlowski 1994b: 261).

A second subregion is composed of those sites on the Urfa, Gaziantep and Mardin plateaus. The Urfa region connects the Syro-Mesopotamian lowlands with the Anatolian highlands (Hauptmann 1999:66). Relevant sites in this area include: Nevalı Çori and Göbekli Tepe. Nevalı Çori is 3 km south of the Euphrates at an altitude of 490 m (Hauptmann 1999: 70). Three radiocarbon dates taken from the two earliest levels provide dates between 8,400 and 8,100 BC (Hauptmann 1999: 78). Göbekli stands on the 800 m peak of the Germiş range, 15 km northwest of Urfa. Two radiocarbon dates give an age around 9,200 BP (Hauptmann 1999: 79).

The final relevant subregion of Upper Mesopotamia is comprised of the Eastern Taurus mountain flanks and the Upper Tigris valleys. Relevant sites in this subregion include: Cafer Höyük, Çayönü and Hallan Çemi itself. Cafer Höyük, discovered in 1976, lies in the foothills of the eastern Taurus range within 1 km of

the Euphrates in a wide, lush valley (Cauvin et al. 1999: 89). Charcoal samples from the earliest levels have provided dates around the end of the 10th and early 9th millennium BP (after Bischoff 2006).

Çayönü, approximately 150 km to the west of Hallan Çemi, lies on the southern tip of the Ergani Plain in the contact zone between the Northern Piedmont and the Eastern Taurus Highlands (Peasnall 2000: 276). The 2-3 hectare mound rises 5 m above the plain at an altitude of 832 m (Özdoğan 1999: 38). 26 radio-carbon dates from the first two subphases range from the end of the 11th millennium BP to the first half of the 9th millennium BP.

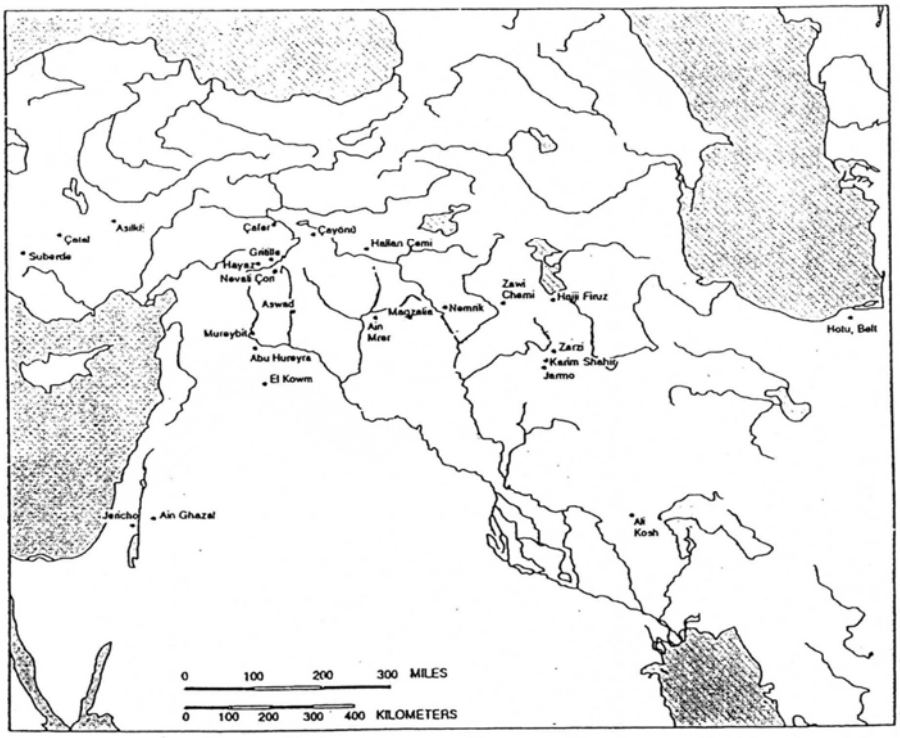

Figure 2 Selected Epipaleolithic and Neolithic sites.

Environmental Background

The Late Glacial period lasted from 14,000-10,000 BP, and included both a warm oscillation (12,000-11,000 BP) and a cold oscillation. The cold oscillation, called the Younger Dryas event, lasted from approximately 11,000-10,400 BP, during which the excavators claim the Hallan Çemi began to be inhabited. At the end of the Younger Dryas, the previously steppic conditions of Upper Mesopotamia became moister, though this did not progress uniformly across these regions (van Zeist and Bottema 1991: 147). The higher elevation of the Anatolian plateaus was likely more conducive to the earlier onset of a moister climate.

Pollen samples from eastern Anatolia and western Iran from before 10,500 BP are dominated by non-arboreal pollens such as *Artemisia* and chenopods, indicating that the vegetation was steppic (Baruch 1994: 111). Steppe or desert-steppe vegetation is typical of very arid atmospheres. After 10,500 BP, arboreal pollens increase in the cores taken from Lakes Van, Zeribar and Urmia (van Zeist and Bottema 1991). These pollens are dominated by *Quercus* (oak) and *Pistacia*. The increase of arboreal pollen grains in the cores indicates that the Oak-Pistachio forest began to spread in Anatolia before the Levant, which also suggests that Anatolia had higher precipitation levels earlier than the Levant or that glacial tree refuge areas existed (van Zeist and Bottema 1991: 123).

Around 10,500 BP, herbaceous pollens remained, as before, a high percentage of the total, yet the types of pollens represented changed. *Artemisia* and chenopodicaea are replaced by Graminaea (van Zeist and Bottema 1991: 55). This

demonstrates that the steppe changed from an *Artemisia* steppe to a grass-dominated steppe between 11,300 and 8,000 BP (Baruch 1991: 111).

Thus, during the time (according to the excavators) of occupation at Hallan Çemi, the area was dominated by steppic vegetation in the lowlands and the scrappy beginnings of an oak-pistachio forest in the hills (Baruch 1994: 113). True forest expansion is not noted in the pollen record until 7350 BP in the Van/Soğutlu area, though it begins much earlier farther to the north in the Urmia region (Baruch 1991: 113).

However, excavated sources suggest that at the time Hallan Çemi was occupied, the area was dominated by a riverine forest. This is supported by wood charcoal remains identified as *Fraxinus* (ash), *Quercus*, *Populus* (poplar), *Pistacia*, *Amygdalus* (almond), *Prunus*, *Salix* (willow) and *Frangula* (buckthorn) (Peasnall 2000:133). The high degree of moisture is demonstrated by an oak charcoal specimen with relatively thick rings (Peasnall 2000:134).

Structure of Inquiry

One major issue is that the area in question straddles several eco-cultural zones, each with its own imposed chronology. The Eastern Taurus region, which includes Hallan Çemi, lies on the blurred boundary of the incongruous Levantine and Central Anatolian chronologies. The terminology for these areas is also conflated. The Levantine chronology for the Neolithic was broken into Pre-Pottery Neolithic A and B (PPNA and PPNB) after Kenyon's report from Jericho (1957). However, the use of the term PPNA automatically links a site to the Levant, for

PPNA cultural assemblages all generally found within the "homeland" or nucleus of Levantine sites. In order to provide a more neutral account of the early Neolithic, the terms Aceramic A and Aceramic B have been used for sites within Anatolia. However, the areas that comprise Upper Mesopotamia are often described in terms of the Levantine chronology, as it was proposed and established first.

Another problem is that one is presented with a great many radiocarbon and related scientific dates, derived from many different laboratory procedures. Some of these radiocarbon dates have been calibrated, and others have not. Those that have been calibrated may not have all been calibrated using the same equation for adjusting the curve, and the curve itself is constantly recalculated. More often than not, radiocarbon dates are presented with only one standard deviation, into which about 67% of all of the counts will fall. Obviously, presenting dates at 2 standard deviations, in which 95% of the counts will fall, is more likely to include the "true" date of the sample, but is often such a large range that it is considered unattractive.

To explore these issues I will focus on the site of Hallan Çemi. I will compare and contrast evidence from Hallan Çemi with Epipaleolithic sites of the Natufian (Levant and Middle Euphrates) and the Zarzian (Zagros Mountains), and again with 9th millennium BP sites in Iraq, Iran, Syria, Georgia and southeastern Anatolia.

The paper will be divided into sections with particular attention to evidence from chipped stone, ground stone, architecture, theories of Neolithic sedentism and domestication, and finally the overarching issue of dating, through which I hope to show that Hallan Çemi should be placed firmly within the Neolithic, as opposed to

the Epipaleolithic date proposed by Rosenberg. I will argue that the population, though enjoying an Epipaleolithic lifestyle, should be dated contemporary with Çayönü and Nemrik 9.

The abbreviation BC will be used for calibrated dates, whereas bc and BP will indicate uncalibrated ones. Whenever possible, I shall try to use BP (uncalibrated before present), so that the most recent calibration curve may be applied.

CHAPTER 2

CHIPPED STONE

This chapter focuses on the lithic technology of the areas and periods pertinent to the site of Hallan Çemi and will attempt to: first, describe the problems faced by archaeologists who employ current analytical frameworks; and second, describe the lithic assemblage recovered from Hallan Çemi and its similarity to certain prehistoric Near Eastern industries. The concern here lies with (from west to east) central Anatolia, the Levant, the eastern Taurus and Zagros ranges and finally north to the Caucasus. These areas will be discussed during the time from the end of the Epipaleolithic to the beginning of the Ceramic Neolithic (or PN), c. 12000-6000 BP.

The first problem that any archaeologist working in Southeastern Anatolia comes up against is that of classification. The conceptual framework comes from elsewhere, yet the southeastern Anatolian sites are largely local industries that embody various attributes of Mediterranean, Levantine, Georgian and Iraqi-Iranian

chipped stone industries. Because the area in question not only displays several regional attributes but also straddles several eco-cultural zones, several chronologies have been proposed for different parts of the whole area. Thus, there is an immediate problem if one wishes to identify the Hallan Çemi material, but this is what a number of scholars have attempted to do, even though the assemblages from Hallan Çemi do not fit neatly into any of these regions; each with its own local terminology. I will begin by discussing lithic typology, describing the main chronologies and their application to sites in Southeastern Anatolia, and the problems of correlating these two. I will then describe the lithic assemblage from Hallan Çemi, its idiosyncrasies, and compare and contrast with 11th millennium BP and 9th millennium BP sites.

Typology

Lithic typology uses *fossiles directeurs*, or diagnostic types, from dated and stratified excavated contexts and extrapolates from them and compares them with what is available from other sites in the region. Unfortunately, few have agreed on how much data should be grouped together into a region or province, as well as the impact of technical innovation and lag. Some confusion is no doubt due to the practice of taking chronologically relevant data from artifacts and creating a timetable that is then employed to provide a date for some new artifact in a disparate region.

There has been far less work in Southeastern Anatolia, and a two-page attempt to provide a lithic typology was only ventured in 1994 (Özdoğan and

Balkan-Atlı). However, it seems that across the board, the Epipaleolithic is distinguished from the Neolithic by the appearance of big blades, especially points.

Chronologies

For Levantine sites, a distinct chronology has largely been constructed by associating changes in architecture with concurrent changes in lithic technology. The Neolithic was originally distinguished from the Paleolithic by the appearance of ground stone and chipped stone sickles, and later ameliorated to add the presence of pottery and evidence for an agricultural economy. The discovery at Jericho of Neolithic levels that did not produce pottery led Kenyon to distinguish a Pre-Pottery Neolithic (PPN) from the Pottery Neolithic (PN). Kenyon then subdivided the PPN sequence into the PPNA and the PPNB, which split between 7500 and 7000 bc, when round house plans and unidirectional lithic cores gave way to rectangular-shaped dwellings and bi-polar cores (Kenyon 1957). These originally stratigraphic units, each with its own associated material culture, came to refer to specific time periods when extrapolated across sites. The "diagnostic" El Khiam points (as well as Salibiya and Jordan Valley points) of the PPNA disappear and are replaced by different point technologies: Helwan, Jericho, Byblos and Amuq (Bar-Yosef: 1994: 6-7). The PPNA assemblages rarely find their way out of the Levant; the northernmost Khiam point was recovered from Mureybet (Akkermans and Schwartz 2003: 50). It is during the PPNB that a wide proliferation of sites is seen, and a common cultural assemblage, or PPNB *koine*, spreads in all directions (58, 61-63).

For Central Anatolia, a recent consortium of archaeologists has proposed an alternate periodization for prehistory based on data from their region of study. Their Early Central Anatolian chronology (ECA I-V) begins at the Younger Dryas and extends to the beginning of the Anatolian Bronze Age. Interestingly, there are no sites known during ECA I, to which the site of Hallan Çemi has been radiocarbon dated. ECA II lasts from c.9,000-7200 BC with Aşıklı Höyük, Musular and Canhasan III as type sites. Lithics are dominated by obsidian, buildings are rectangular, bi-polar core technology is known, and resources are still wild. ECA III (late 8th millennium-6,000 BC) is distinguished by the appearance of pottery and agriculture (after Özbaşaran and Buitenhuis, CANeW).

Eco-Industrial Provinces

By extending the well-known Levantine corridor north, one finds quite similar lithic assemblages and industries, leading Kozlowski (1994) to term this area the "Levantine eco-industrial province". The Middle Euphrates Epipaleolithic sites of Mureybet I-II and Abu Hureyra, as well as the PPNA-B site of Çayönü during the Grill Phase are characterized as belonging to this province, as the diagnostic point shapes have been recovered in substantial quantity. It must be kept in mind that these "eco-industrial provinces" are for lithic typology only, and do not adequately reflect other aspects of local material culture.

For the "eastern wing" of the Fertile Crescent, that is, sites mostly in modern Iraq and Iran, Kozlowski groups these industries into the second of his three "eco-industrial" provinces, which he names Iraqi-Iranian. For all three of his mega areas

(Levantine, Caucasian-Caspian and Iraqi-Iranian) he uses the Levantine chronology of Epipaleolithic, PPNA, PPNB, PN, etc. To these he adds the term Protoneolithic (also called Mesolithic in the north), to be distinguished from within the Epipaleolithic as Protoneolithic sites are those occupied by semi-sedentary peoples about to become "Neolithized" (Kozlowski 1999: 24). The Epipaleolithic of the Iraqi-Iranian province is characterized by finds from Zarzi, Warwasi and Palegawra, with greatest numbers of microliths and notch/denticulates (Olszewski 1994: 85). Most microliths from Warwasi and Zarzi are not geometric, and those geometrics that exist are usually scalene triangles (Olszewski 1994: 86). Between the extant dates for the Epipaleolithic and Protoneolithic of the Zagros, there is a 3,500 year gap with no known sites in Iran (Hole 1994b: 105). There are, however, certain characteristics that indicate continuity between the Epipaleolithic and the early Ceramic Neolithic of the Zagros at sites like Karim Shahir and M'lefaat, such as the production of linear blanks and the presence of microliths (Olszewski 1994: 87).

The reasonably uniform assemblage of the Iraqi-Iranian Epipaleolithic divides during the Protoneolithic (9th-8th millennia bc) into the Nemrikian and M'lefaatian (Kozlowski 1994a: 143). The Nemrikian and M'lefaatian industries are characterized by conical "bullet" cores from which elongated, regular bladelets and less regular blades came (149). Backed microliths, as well as backed and retouched microliths are common, yet geometric microliths are rare (149). The two industries differ in terms of retouched tools, though both have as the highest percentage retouched blades followed by retouched flakes (149). The Nemrikian industry

generally has more perforators and fewer retouched blades (163). Between the Epipaleolithic (Zarzian) and Neolithic (Nemrikian and M'lefaatian) of Iraq falls the open-air loess site of Zawi Chemi Shanidar (Kozlowski 1999: 61). The industry here can be seen as a transitional phase, especially as the microliths are characterized by (almost exclusively) three types: backed pieces, backed and truncated pieces and crescent-shaped convex pieces (61). During the M'lefaatian, the number of crescents dwindles to zero, while the number of backed pieces increases (61).

The remaining "eco-industrial" province, termed the Caucasian-Caspian, seems to be a blanket term for sites that did not fit neatly into other categories. This province includes the following industries: the Trialetian and the Imeratian from Georgia; the Chokhian from Azerbaijan; the Shan-Kobanian from the Caucasus and Crimean mountains; as well as those assemblages found in Belt and Ali Tepe in Iran (Kozlowski 1999: 139). Kozlowski, though first refusing to place the "local industry" from Hallan Çemi in any overarching category (Kozlowski 1994a: 144), later capitulates and places it, too, in the Caucasian-Caspian province (Kozlowski 1999: 139). None of the sites within this province have been coherently dated with the exceptions of Hallan Çemi and Ali Tepe (140). The shared technology and *fossiles directeurs* in this province are largely associated with Mesolithic (Epipaleolithic) industries: most notably geometrical, large microliths. Another similarity between these sites is that they are all cave sites, with or without oval stone dwellings inside, or temporary open sites used by hunters (139). All of the lithic industries from these sites continued for a very long time without any

association with typically "Neolithic" material, such as: stone bowls, clay figurines, "tokens" or a ground stone industry. The sole exception is Hallan Çemi (139).

Chipped Stone from Hallan Çemi

Unfortunately, none of these regions or provinces entirely reflects the "very original industry" (Kozlowski 1994a: 149) from Hallan Çemi itself. The striking features of this assemblage are: a dearth of projectile points; a huge number of microlithic geometrics; and a great proportion of obsidian pieces, most of which were quite small (Rosenberg 1994a: 237). The obsidian blades were detached using indirect percussion, perhaps with deer antler tines as a punch (230). Given the radiocarbon dates, in theory, the chipped stone industry should be contemporary with the Natufian and Zarzian industries.

The lack of large projectile points has led to several different conclusions. One is that the inhabitants of the site lived before the time of arrowheads. Another is that something else substituted in their assemblage for arrowheads. The excavator suggests that the scalene triangle geometrics may have been used in place of arrowheads (Rosenberg 1994a: 237) **[Fig 3]**. Yet another possible replacement is the sling ball. The conclusion of Korfmann's 1972 dissertation was that the use of either sling balls or arrowheads as long-range projectiles was exclusive over the course of several millennia in the Near East (Korfmann 1973: 42). Sling balls, made from water-worn stones, can only be identified by archaeologists when many are found cached together, with no evidence of other use such as battering

(Korfmann 1973: 38). Small caches of balls have been recovered from Hallan Çemi, though their use as sling balls or bolas is still debated.

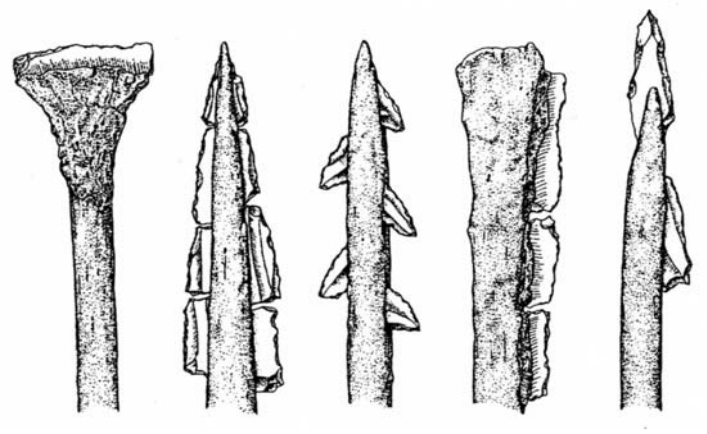

Figure 3 Possible ways microliths could have been mounted as projectiles

Microliths

It was previously thought that the hallmark of the Epipaleolithic was the addition of backed, retouched microliths to the toolkit. However, this has been debunked by the discovery of backed and retouched microliths in an Upper Paleolithic context, as well as sites dated well within the Epipaleolithic span of 10,000 years that have very few of this "diagnostic" type (Byrd 1994: 206). This has led some to deem the use of the term Epipaleolithic outdated (206). It is not simply the presence of microliths, which continued throughout the entire Neolithic, but the absence of big blades that is used to date, characterize or define a site.

The microliths recovered from Hallan Çemi are almost entirely geometrics, with the sporadic backed bladelet, a single microburin and a few fully backed

ovates (Rosenberg 1994a: 230). Despite the preponderance of microlithic tools, it is unlikely that the overall industry at Hallan Çemi should be called microlithic (237). Both geometrics and other blade tools appear in full-sized forms, and the majority of microliths were made of obsidian (237). This is important because obsidian was a valued resource, used preferentially for the creation of blades. Thus were a blade to have been damaged, its reuse in a smaller form was guaranteed. To reiterate; it was not the size that was preferred, but the material, and this alone led to the smaller size of many tools.

Even if the intensively exploited obsidian was not enough to explain why the assemblage is not Epipaleolithic in character, microliths were recovered from many other Anatolian sites fully within the Neolithic. They were found in all levels of the PPNA-B site of Çayönü, further along the Tigris (Caneva et al. 1994: 263). At Cafer höyük during the early phase, a third of all retouched tools were microliths, and included some geometrics (Kozlowski 1999:110). Microliths also appeared in 3 of the 5 late phases of Cafer höyük and also at the early PPNB site of Nevalı Çori (Özdoğan and Balkan-Atlı 1994: 206).

Geometrics

At the end of the Epipaleolithic (c. 9th mill. bc) microliths all over the Near East become more geometric with the appearance of lunates, crescents and trapezes (Kozlowski 1994a: 145). Lunates and backed pieces with truncations appear in the Zarzian industry; triangles appear in the Natufian; crescents, double truncations and trapezes appear in the Caucasian-Caspian province; and isosceles triangles appear at

Öküzini (145). During the Protoneolithic (c. 9th-8th mill. bc), geometrics disappear from the Natufian and very early on at Mureybet; scalene triangles appear at Öküzini; and the same geometric forms of the Zarzian are repeated in microlithic dimensions (145). This is perhaps a result of a change in core technology, from the use of hammerstones to punch and pressure flaking (Olszewski 1994: 86).

The geometric pieces of the early Natufian are mostly lunates (Akkermans and Schwartz 2003: 26). Geometrics, though few, from Zarzi and Warwasi are largely scalene triangles, though Warwasi produced a few isosceles triangles and convex pieces, such as lunates (Olszewski 1994: 86). Geometrics from sites classified as having Trialetian industries are dominated by trapezes until c. 7,500 bc (Kozlowski 1999: 140). Belt Cave, south of the Caspian Sea, produced one short scalene triangle between 9,500 and 7,500, but from 7,500 bc to the end of the 7th millennium triangles and pen-knives joined the trapeze-dominated assemblage. Another Trialetian industry, that at the undated site of Dam Dam Cheshme east of the Caspian Sea, produced only trapezes and short triangles in the lowest levels, and only in the uppermost levels did any elongated triangles appear (145).

Of 135 total geometrics recovered from Hallan Çemi, 129 were in the form of elongated scalene triangles. The other six pieces were convex (Rosenberg 1994a: 230). This is most similar to the upper levels of Dam Dam Cheshme and Belt Cave, though they are over a thousand kilometers **[Fig. 2]** and at least a thousand years apart. In the later, ceramic levels at Çayönü, geometrics in the form of rough lunates appear (Özdoğan 1994: 272).

Obsidian

In general, the presence of obsidian is a good chronological marker. The more obsidian found at a site, the more likely the site will be dated after the Aceramic Neolithic (Hole 1994b:113). Obsidian from Hallan Çemi was identified by its trace elements as having been brought from the Nemrut and Bingöl A and B sources, each 100 km from the site (Rosenberg 1994a: 225). Despite the lengths traveled over rugged terrain to reach this raw material, more than half of the 4,340 pieces examined in 1994 were of obsidian (225). The intensity of obsidian use can be understood as obsidian accounted for only a third of the total chipped stone by weight, despite the great number of pieces; and also as far fewer obsidian pieces were left without retouch than those of flint (225). Obsidian was also preferentially used in the manufacture of certain tools. Nearly all of the blades were made of obsidian, and 2/3 of all blade cores were obsidian, all of which had been exhausted (225).

Obsidian is rare or even absent at Zagros Protoneolithic sites, which are at least 500 km from obsidian sources **[Fig 2]**. The obsidian that is seen, has been traced to the Bingöl sources (Sherratt 2006b: np). Obsidian only appeared in the Levant and Syria at the very end of the Natufian period (Akkermans and Schwartz 2003: 82). The obsidian sources exploited by those in the Levant were largely from Cappadocia, with very little from the Bingöl area in the PPNA, and with increasing amounts in the PPNB (Sherratt 2006b: np). A further tie between the Zagros 'hilly flanks' and Hallan Çemi is seen in the obsidian sources that both exploited.

Conclusion

In sum, while the presence of microliths could lead to the conclusion that Hallan Çemi should be dated to the Epipaleolithic, it has been shown that the smaller size of many points was due to intensely utilized obsidian, which itself is characteristic of the Ceramic Neolithic.

Hunters are conservative, having stable lithic industries, and tend to attain raw materials from the same sources (Kozlowski 1999: 25). Another tendency that leads to conservative or unchanging technology is isolationism (29).

It is clear that the Zarzian tradition of an assemblage with a high proportion of tools, of which nearly half were microliths traveled northwest along the Tigris from Zarzi to Zawi Chemi Shanidar and then to Hallan Çemi, and the conservative style of hunter gatherers led them to both reuse obsidian, a highly prized resource for blades, and resist new technologies.

It is not strange to suggest that different elements spread at different paces through different communities, and thus the appearance at Hallan Çemi of a Trialetian-like industry. The geometric forms may have trickled down through the mountains, but it is nonsensical to assume they arrived from the north a thousand years before they appeared at their site of origin. It is easier to conclude that the scalenes from the earlier site of Zarzi and the crescents from Zawi Chemi Shanidar evolved into the geometric assemblage of Hallan Çemi.

Even though the utter absence of big blades and prominence of microliths argues for an Epipaleolithic date for the assemblage, the high proportion of obsidian and the favored type of geometric (scalene triangle) appears to be evidence for a

later date. The site of Hallan Çemi could easily have been an outpost for a population resistant to the Neolithic, living amidst many groups that had already begun the transition to an agricultural economy.

CHAPTER 3

Ground Stone

The ground stone assemblages of Hallan Çemi have been likened to those from the Zarzian Epipaleolithic by Rosenberg (1999: 29), as well as those from Southeastern Anatolian PPNB sites (Özdoğan 1999: 228). However, providing a chronology for these assemblages by themselves presents quite a challenge. Chipped stone assemblages are often dated by the presence or lack of "diagnostic" elements. This unfortunately is not true of ground stone assemblages, which are often only described briefly. One might posit a generalization that "chisels appear after hammers" but this is not used for dating an assemblage. In order to place the material culture from Hallan Çemi chronologically, I will first describe the assemblage and attempt to identify the more salient points for comparison and then describe the differences and similarities between non-ubiquitous forms with finds from other Near Eastern sites.

Hallan Çemi

The ground stone assemblage from Hallan Çemi has several remarkable characteristics. As a whole, it consists of well over 1,400 objects, including: pendants, beads, vessels, pierced and semi-pierced stones, mortars, querns, pestles, mullers, grooved stones, notched batons, slingstones and small stone plaques similar to stylized bucrania. Certain objects, such as beads, pendants, utilitarian pestles and pierced stones, are so broadly distributed among Neolithic sites that it is not within the scope of this chapter to discuss them but briefly. Spherical limestone artifacts thought to have been used as slingstones or as bolas were also recovered at most of these sites, such as Demirköy and Nemrik. Most striking in comparison with other sites along the Tauros-Zagros arc is the utter lack of heavy wedge scrapers such as celts or adzes (Rosenberg 1991: 119)[1]. Indeed, large artifacts are rare. Mortars are few compared to the preponderance of their counterpart grinders. However, this dearth of mortars is seen along the Taurus-Zagros arc in conjunction with a large number of extant pestles and is therefore not specific to the site of Hallan Çemi. It has been suggested that mortars were more efficacious for pounding nuts and querns for grinding seeds. However, the higher preponderance of querns at Hallan Çemi is puzzling in light of evidence that nuts and pulses played a more significant dietary role than small-seeded grasses (Rosenberg et al. 1995: 7). The percentage of seed remains at Hallan Çemi is dominated by two genera (60%), followed by legumes (Savard et al. 2006: 190). This predominant reliance on neither nuts nor seeds may have led the population to favor neither querns nor

[1] One adze was mentioned in the initial site report, but it was later reported as coming from a non-Neolithic context (Peasnall 2000: 163).

mortars, but to consider all such equipment as multi-functioning. Additional evidence for this might be seen in the re-use of handstones as nutting stones (Rosenberg et al. 1995: 6).

The presence of highly decorated objects sets Hallan Çemi apart from other early sites in Iraq and Southeastern Anatolia. Even some of the pierced stones appear to have been ornamented (Rosenberg 1999: 28). Nearly a third of all pestles recovered were fancy, with straightened shafts and/or decorated finials (Peasnall 2000: 166). Hundreds of fragments of stone bowls with incised decoration and perforated rims were unearthed, as well as "notched batons" – wands of stone with tapered ends and perpendicular notches thought by some to be used for tallying purposes (Rosenberg 1994: 82).

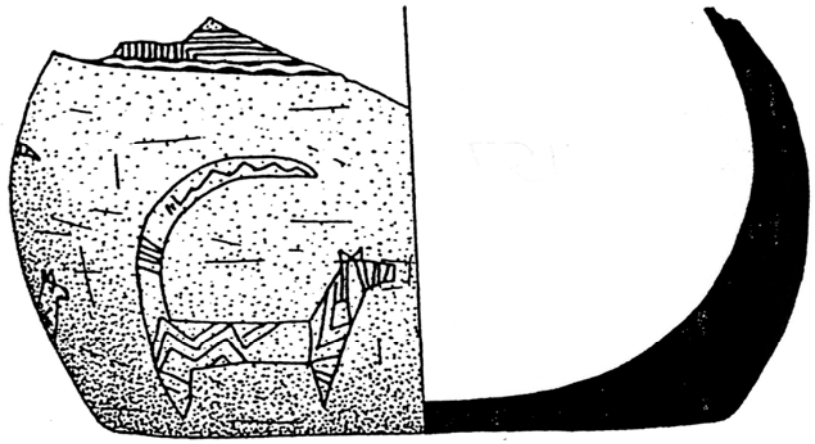

Figure 4 Vessel fragment from Hallan Çemi with incised canid

Vessels

At Hallan Çemi, several hundred fragments of vessels were recovered. Most bowls were made of a dark chloritic stone; often grey, green or black in color. Various motifs of incision appeared on some of these bowls, including: crosshatching, meanders, zigzags, nested crosses and even a specimen that appears to be decorated in low relief with serpents (Rosenberg 1999: 28). Other, less abstract, incised decorations include canids **[Fig. 4]**, serpents and floral representations. Most vessels are round and flat-based, with a diameter of less than 20 cm (Rosenberg and Davis 1992: 4-5). There was also evidence for larger limestone vessels, with less effort put into their manufacture. Both evidence of repair and the presence of roughed out blanks led to the conclusion that the vessels were produced on-site (Rosenberg 1995: 11).

The earlier site of Zawi Chemi Shanidar has produced but one fragment of a quartzite vessel, though beads were recovered in a chloritic stone similar to that used at Hallan Çemi for vessel production (Peasnall 2000: 109). The roughly contemporary sites of Karim Shahir and M'lefaat in Iraq have produced one and three fragments, respectively. The single fragment from Karim Shahir is thought to be of a later date, as it is from a very fancy, small and incised steep-sided plate (218). The three fragments from M'lefaat come from oval-shaped, rimmed vessels (392). The slightly later site of Nemrik 9 has produced fragments from four polished, but otherwise undecorated vessels. A deep, semi-spherical bowl with a diameter of about 14cm was made from white marble, while the other, larger, fragments came from vessels made of pink and white sandstone (441-2).

Bowls have been found at many later Central Anatolian sites, but few sites approach the abundance with which they were recovered at Hallan Çemi. Fragments of decorative vessels made of the same dark chloritic stone were recovered from the contemporary (or slightly later) round house subphase at Çayönü, and again from the Grill plan subphase (Özdoğan 1990: 59). These vessels, though larger and less abundant than those at Hallan Çemi, are their closest analogues. Incision and low relief were used to decorate these specimens. Also as at Hallan Çemi, a light-colored limestone was used for the production of undecorated, utilitarian vessels.

Fancy Pestles

Of a stunning 354 pestles recovered from Hallan Çemi, 118 were classified as fancy, some of which had sculpted finials. These pestle fragments ranged in size from a few centimeters to 20 cm long. The finials were decorated with a variety of motifs: goat heads **[Fig 5-a]**, down-curving barbs **[Fig. 5-c-f]**, and what may well be a pig **[fig 5-b]**.

Although utilitarian grinders were recovered from every site, those with which extra care had been taken to shape, straighten and even polish the shaft were found in a limited context. Some of these pestles had sculpted finials with zoomorphic or anthropomorphic representations. Fragments of shaped pestles with long, straightened shafts appear in small quantity at the upper layers of Zawi Chemi Shanidar and Karim Shahir (Peasnall 2000: 115, 396). Four "rod" fragments from M'lefaat may also be shaped pestle shafts (396).

Of over a thousand total pestles recovered from Nemrik 9, 25 had inordinate care taken in their manufacture, with straightened sides and sculpted finials (Mazurowski 1997: 129). Most of these came from the upper two levels, with only 3 examples from the first three occupation levels. Four of the total depicted anthropomorphic features: three heads and one mid-section with a sculpted buttocks from the middle of a pestle. Of the heads, the earliest is from the floor of house 6 in occupation phase II (131-2). The buttocks was found at level IV, and the remaining two heads came from a fill of level IV, and should probably be associated with level V. Of the remaining 21 zoomorphic representations, four have roughed-out finials that appear to have been abandoned during the manufacturing process. The earliest identifiable pestle is ornitomorphic in character and found in level III (134-5) **[Fig 6-a]**. The thick down-curving beak is separated on both sides by an up-curved incision, and the eyes are represented as flat circular protuberances. Level IV produced pestles in the shape of a panther head, a ruminant leg and two more bird representations. As the first two forms are unknown from Hallan Çemi, I will only describe the birds, which may be related to the down-curving barb shapes. One of these is little more than a vaguely-shaped water fowl **[fig 6-b],** while the other **[fig 6-c]** has a well-defined head, circular hollows for eyes, beak division split with a flint tool, and two oblique lines between the eye and upper beak (136). Of the various representations, birds, likely rooks or crows, dominate, **[6-d, e]** and are generally less stylized and of a higher quality that those of Hallan Çemi.

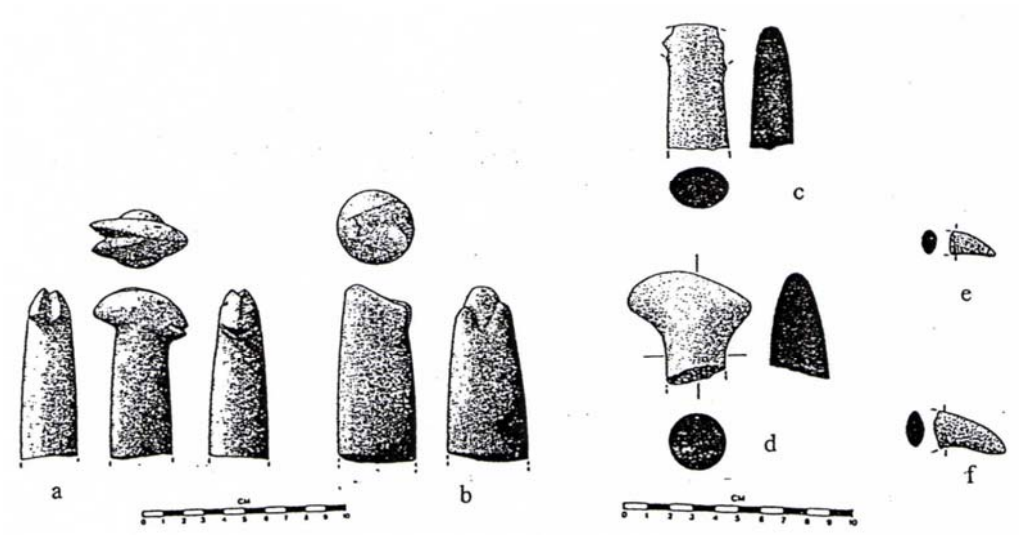

Figure 5 Zoomorphic pestles from Hallan Çemi.

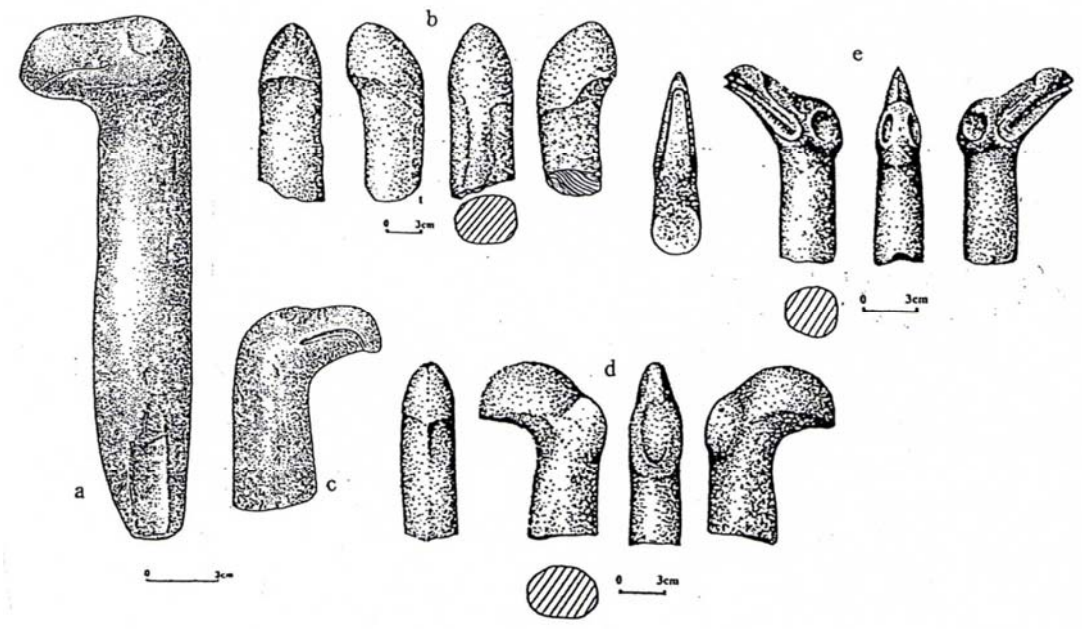

Figure 6 Shaped pestles from Nemrik 9.

In Anatolia, fancy pestles are less abundantly seen. Two polished shafts and one finial were recovered from the Cell Plan subphase at Çayönü (Peasnall 2000: 312). Aslı Özdoğan (1999: 59) suggests that, since pestles and bowls were found in a PPNA context at Hallan Çemi and in a late PPNB context at Çayönü, this is evidence for their special status as heirlooms and retention over generations. Far and away the largest numbers of shaped and decorative pestles (after Hallan Çemi) come from the nearby site of Demirköy and from Nemrik 9 in the Mosul region of Iraq**.**

Elongated stones: notched and grooved

An interesting class of items called "grooved stones" is thought to have been used as shaft straighteners. These are formed from elongated river pebbles and have a "U" or "V" shaped incision, often polished from wear. The grooved stones from Hallan Çemi are all characterized by the "U" shape, as is the single example from Mlefaat (Peasnall 2000: 222). Other sites have a mixed assemblage with both "U" and "V" shaped grooves. The V-shaped grooves are found at Zawi Chemi Shanidar, Demirköy höyük, Çayönü, and Nemrik 9 in conjunction with "U" shaped ones (Peasnall 2000: 113, 222, 309, 444).

Perhaps appended to this group are the "notched batons" that appear only at Hallan Çemi and Demirköy, 40 km to the south **[fig 7]**. These artifacts are fragmentary, none longer than 10 cm, with at least one tapering edge. Anywhere from one to eight transverse notches appear in a line. Vaguely similar stone

objects, though truncated, have been recovered from Nemrik 9 **[fig 8]**. Smaller examples of chloritic pebbles with etched lines have been recovered from Zawi Chemi Shanidar (Solecki and Solecki 1970). These take many different forms, but are generally much smaller and of a different shape than the carrot-shaped items from Hallan Çemi. Notched bone awls from late Kebaran sites are also known, those from Jiita and Ksar Akil (both near Beirut) were marked with grouped transverse incisions (Moore et al. 2000: 163).

As for the notched batons, any number of wild speculations could be made about these artifacts. Perhaps they represented a phallus, and for every new summer of a young boy's life, a notch was carved until the festival of circumcision. Or perhaps these batons were used for the same administrative purpose as clay tokens, though by a people who did not use clay. In any case, no verdict can yet be reached.

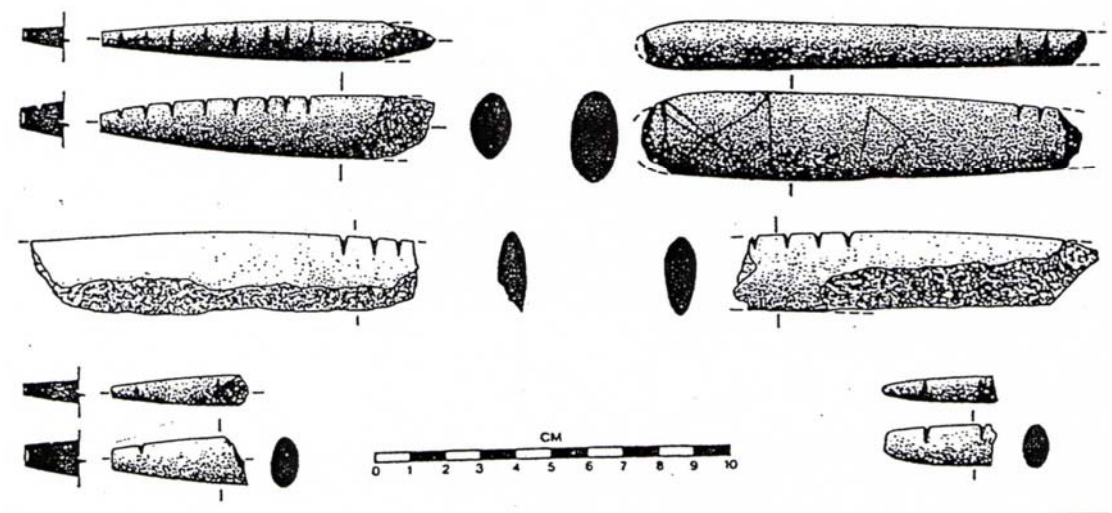

Figure 7 Notched batons from Hallan Çemi

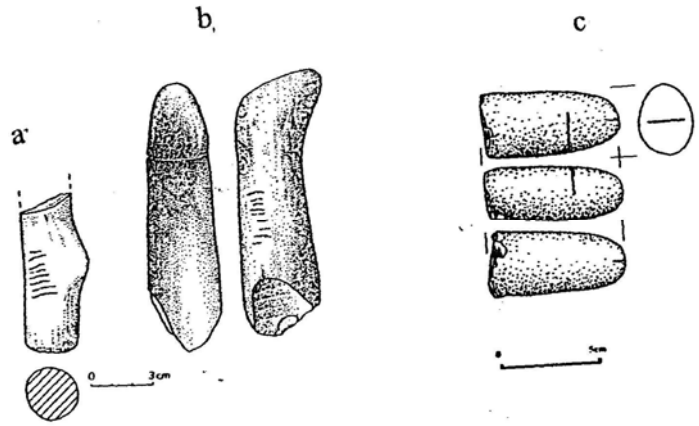

Figure 8 Notched pestles and phallus from Nemrik 9

Discussion

As the similarities between the ground stone artifacts from both Zarzian Epipaleolithic and Southeastern Anatolian PPNB sites have been demonstrated, it remains to be seen if there is any evidence for other elements that may have influenced or have borne the influence of the populations that lived at Hallan Çemi. Simply looking at a map **[fig 2]** it is easy to see a line curving along the Tigris, between the sites nestled on tributaries, ultimately penetrating central Anatolia. Perhaps it is no coincidence that the evidence for settlements flows against the river until it begins, from the southwest to the northeast. The remaining two directions of

inquiry are the southeast, the middle Euphrates region down to the Levant and the northwest, through mountain ranges to the Caspian region.

The Mesolithic sites in the southern Caucasus had very roughly worked ground stone implements until the late Neolithic, when drilling and polishing was mastered (Kushnareva 1997: 16). This late appearance of a ground stone industry in the southern Caucasus is thought to be due to a late influence from southwest Asia (16).

From the Levant, the Natufian ground stone includes both stone bowls (sometimes engraved) and pestles ending in a hoof (Akkermans and Schwartz 2003: 27). The late Natufian settlement at Abu Hureyra, which was founded around 11,000 BC, has produced many ground stones items, and though some were roughly shaped, none were as polished as those found from Hallan Çemi. Of the 147 stone artifacts recovered from the oldest building level, 3 were fragments of basalt vessels (Moore et al. 2000: 173). Of the three, the outside of one was decorated all over with cross-hatched lines and had evidence of holes for suspension and of burning underneath (173).

It is clear, then, that the technology of making polished stone vessels and pestles was brought from Zarzian Epipaleolithic sites to Hallan Çemi, and thence to central Anatolia. In general, the pestles and bowls found at sites earlier than Hallan Çemi are less fancy. The sole exception is the more naturalistic (and anthro-pomorphic) assemblages found at Nemrik 9. The greater intricacy of the pestles at Nemrik 9 could be explained as a result of return migration of a part of the population from Hallan Çemi, or as a chronological problem.

The function of these vessels remains to be seen. It has been suggested that, due to the effort spent in polishing chlorite bowls and pestles, these artifacts were endowed with a ritual significance (Rosenberg, Özdoğan, etc). Other scholars have denied the ritual use of these by pointing to both their re-use and their placement in dumps, fills and pits (Mazurowski 1997: 130). The intentional destruction of vessels by punching out the bottom can be seen as support for both positions. Vessel parts re-used in the walls of later building levels points to their utilitarian function. Certainly whapping a hole in a stone is more fun than continuously bringing rocks up from the river or dragging them out of fields. Mazurowski (1997: 151) has suggested that vessels were destroyed upon the death of their owner. This conflicts with Özdoğan's theory that the vessels were passed on as heirlooms (1999: 59). More evidence contrary to the idea that vessels were destroyed in mourning is that large numbers of utilitarian querns and mullers that show evidence of intentional destruction were found at sites in northern Iraq and southeast Anatolia. Perhaps with the common destruction and reuse there is a *chaine operatoire* of ground stone as well, from bowls and querns to pestles, notched batons and pendants.

Conclusions

Instead of a ritual use for the polished vessels, perhaps they were used for storage. The holes pierced near the rims of many vessels indicate that the vessels were suspended or covered with hides, and, in the absence of storage facilities of any type, could easily have been used in their stead. The fancy pestles created from

the same dark chloritic stone may have been used in conjunction with the bowls (Rosenberg 1999: 28), but the pestles chosen to have extra care put into their creation could have been due to the lovely color and ease of shaping. The separate use of pestles and vessels is supported by evidence from Nemrik 9, where many fancy pestles were recovered, yet only a few fragments of vessels.

The designs etched and carved into stone are very similar to those found at Nevalı Çori and Göbekli tepe. The canid, with its upswept tail reminds one both of the curved wolf-like creature from Göbekli (after Hauptman 1999: Fig 30) and an incised limestone plate from Nevalı Çori (Fig. 17). The wiggly snake motif with its peculiar triangular-shaped head, carved in bone several times at Hallan Çemi, is seen variously at both sites, on sculptures and T-shaped pillars. The iconography and raw material of the ground stone from Hallan Çemi is certainly more similar to sites in Anatolia during the 10^{th} and 9^{th} millennia BP than to any Epipaleolithic site.

CHAPTER 4

ARCHITECTURE

Having discussed the portable material culture, I will proceed to the architectural elements of Hallan Çemi. I will first describe architectural features associated with each level: platforms, plaster features, hearths and structures and then place them in relation to each other. I will describe the building levels and then evaluate each building level in terms of the four observable aspects of architecture: construction technique, architectural form, permanent internal features, and roof support (Kozlowski and Kempisty 1990: 352). I will conclude with a discussion and comparison with structures from other sites, as architecture can be used to provide general dates timeframes. For example, it has been proposed (Flannery 2002: 421) that the round shape of a house was a feature of the Natufian Epipaleolithic, while the rectangular shape replaced it during the PPNA.

Description

During the excavation, four building levels were discovered that could be attributed to the Aceramic period. Unfortunately, only the upper three were excavated (Rosenberg 1999: 26). Common to each level was a central open depression replete with fire-cracked stones and animal bones. The c. 15 m area was used both as a place for refuse disposal and for temporary hearths. Circular platforms were arranged around this area, made variously of stone, packed mud and plaster[2]. These platforms were c. 2 m in diameter and rose to a preserved height of 10-40 cm. Rosenberg, the excavator, hypothesized that these were foundations for storage silos, as no storage pits were found. Other features included low raised plaster hearth boundaries, with fire-cracked rocks inside, approximately 50-70 cm in diameter. These plastered rings were found both inside and outside of structures (Rosenberg 1999: 25). Large irregular lime plaster expanses, associated with the outside of structures, were discovered in addition to postholes. Thousands of fragments of burnt mud with impressions of wood led excavators to believe that wattle and daub was used for building superstructures in all levels.

Building Levels [Fig. 9]

The structures from the lowest building level are U-shaped in plan, and built directly on the ground. The walls are built of coursed river cobbles adhered with plaster, and the floors are unpaved (Rosenberg 1999: 27). Three such structures exist, to the north, northwest, and south of the central depression (Rosenberg

[2] Özdoğan (1999: 288) has claimed that lime plaster was used at Hallan Çemi, while Rosenberg refers to mud plaster used to seal raised platforms (1999: 26). Peasnall (2003: 150) describes the external plaster floors as lime plaster. These appear in all three excavated building levels.

1995:10). The northernmost structure, 3C (or M), is very close to the edge of the depression, while 3B (or L) lies some 15 m west of 3C, and c. 7 m from the edge of the central pit (after Rosenberg 1995: 14, Fig.1)[3]. The southernmost structure, 3A (or K), also lies c. 7 m from the edge, approximately 20 m from 3B and 3C. Approximately five meters to the northeast of 3B (aka L), lies a roughly square plaster feature 2-3 m in diameter (after Rosenberg 1999: Fig.2). Seven meters directly south of the same structure lies a stone platform 1-2 m in diameter. It is essentially a ring of flat stones set on edge, filled with mud and covered with flat stones.

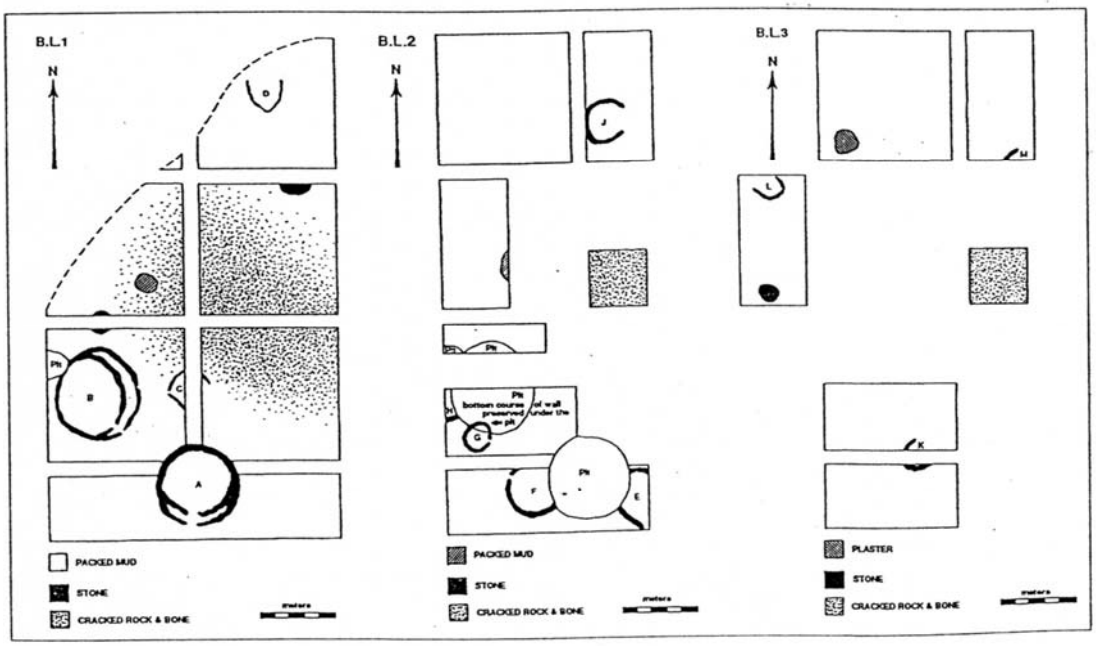

Figure 9 Excavated building levels at Hallan Çemi.

[3] The assignations of letter and number are taken from Rosenberg 1995, while the sole letters are taken from Rosenberg 1999.

The second building level has a total of five structures, four of which were completely excavated. All five are surface structures, and all five are constructed using the same plaster-mortared cobbles as the previous building level. Three of the excavated four had floors paved with sandstone slabs. The fourth, however, was unpaved. Structure 2C (or J) lies 5 m north of the central depression, and 2 m northwest of the northern structure from the lowest building level. It is nearly a perfect C-shape, with a diameter of 3 m, and an opening to the east. The floor is unpaved. The unexcavated structure, E, was not mentioned in the 1995 report, though it appears to be 4-5 m and U-shaped. Its northwestern corner was destroyed by the pit for the overlying building (1A or A). Also partially destroyed by the same pit, albeit to the west, is structure 2A (or F), a round building 4m in diameter with a floor paved with close-fitting slabs of sandstone. Building 2A (F) is distinguished both by layers of plaster over the flagstone, and by a plastered basin in the center (Peasnall 2003: 53). Both structures E and F are approximately 5 m south of the central area. Two meters northwest of structure 2A (or F) lies another, smaller circular paved structure. The bottom course of the wall of 2B (or G) was preserved under the pit for the overlying structure (1B or B). Only one meter of curving wall was uncovered of structure 2D (or H), as the rest was under either the baulk or structure B. This, too, had a paved floor. Approximately 2 m west of the central pit, and 7 m north of G, lies a packed mud feature with a diameter of 2-3 m.

The uppermost building level has four excavated structures, all of which are constructed from sandstone, not river stones. Two are U-shaped surface structures, and two are fully round buildings with a doubled wall at the entrance. Structure 1D

(or D) lies 7 m north of the central depression with an opening facing north. 5 m to the south of D is a stone platform, near the edge of the central depression. Fifteen meters southeast and across the central pit is a structure shaped like 3 sides of a square, with the southwest side open. 1C (or C) is approximately 2 m along each side and unpaved. Two meters south of C is the northernmost point of building 1A (or A), with an opening facing south. Three meters to the northwest lies building 1B (or B). One meter north of B is another stone platform, c. 2 m in diameter, and 3 m to the northeast of the platform is another, of packed mud, fully within the central depression. Buildings A and B are both 5-6 m in diameter, with circular walls of limestone slabs c. 10 cm thick with a related exterior about 50 cm higher than the interior. Each has a semi-circular stone bench or platform against a wall, doubled walls at the entrance, and the floors were resurfaced numerous times with yellow sand and plaster. House A was fully excavated during the 1992 season. The interior walls are preserved to a height of c. 1 m. At six points along the wall there are vertical gaps of 10 cm, presumably for vertical poles. There is also a collapsed stone feature in the very center (Rosenberg 1993: 124-5). House B was fully excavated the following season, and the stone feature in its center was intact. It consisted of three squared sandstone slabs set on end to make a U shape (Rosenberg 1993: 125). It is thought that this served as a footing for a central post to support a roof (Rosenberg 1994b: 80).

Synthesis

Construction technique and architectural forms are identical for the lower two levels: U-shaped surface structures made from river cobbles mortared with plaster. Permanent internal features appear in the second building phase, with paved floors and a central plastered basin. No evidence for roof support yet exists. By the most recent building level, evidence exists that the builders' approach has changed. A new type of structure exists: the semi-subterranean round house. These houses are constructed with sandstone slabs, and the floors were resurfaced many times. Permanent internal features include benches and storage areas, and evidence for a support system for a roof exists.

Discussion

What, then, could be the cause of this change between the uppermost building levels? Could there have been a great lapse in time between levels? To answer this, the uses of the different structures must be considered. The excavator concluded that all of the structures 2 m in diameter and larger were houses used by a permanently settled population, and the largest buildings of the uppermost building level were used as public buildings. To support this claim, he cites the domestic materials found associated with these structures.

The structures from the lowest level are only preserved to a few courses of mortared river stones. If these are truly houses, one must wonder what happened to the rest of the walls. Published pictures do not show any fallen rubble around these, and therefore, it seems safe to conclude that these foundations were only built a few

courses high. This symbolic boundary would not even contain a child, and yet it seems people did inhabit these structures. Some sort of perishable material or combination of materials must have served for the superstructure; the leather or cloth of tents, or a more permanent light wall of wattle and daub. In any of these cases, one would expect evidence of post holes. These were found in the southern part of the excavation, in the levels below the semi-subterranean buildings, most likely because the deposits there were less rocky than in other areas. However, the excavator avers that the few found were only a tiny fraction of what really existed (Rosenberg 2007: personal communication).

Building Level 1

One option is that these U-shaped structures were used as temporary weights for tent edges. This is seen in areas with high winds. At Hallan Çemi there is a strong catabatic wind, which becomes more intense at nightfall. At times, it was impossible for the excavators to sleep outside, both due to the roar of the wind and the mattresses (with sleeper!) being lifted up (Rosenberg 2007: personal communication). This fierce wind could be the reason for both setting down rings of stone and later mortaring them.

Another option is that these U-shaped structures may have started off as storage for querns or large objects during the seasons when the population followed herds and only later adapted for residence. Mobility of the population is implied by the depth and contents of the central depression, around which the U-shaped structures were placed. Though it is possible for the wind to have swept together

rocks and bones into the hollowed area, the deliberate placement of three bucrania as well as the articulated remains of butchered animals suggest otherwise. It seems this site was a favored campsite for many groups over a long time, as the contents of the depression extend below the building levels.

The three structures from the lowest building level, arranged in a rough triangle around the central activity area at distances of 15-20 m away from each other, were built with each opening facing a different direction. Only K faces the central pit, and on the basis of this, I suggest that it was the first construction. After the abandonment of K, perhaps many decades passed before another group arrived at the site and decided to imitate the mortared construction, yet did so in a non-threatening manner, in case the builders of K should return.

Another option is that the group was large enough to require several structures. However, determining if the structures were contemporary requires micro-stratigraphical analysis that was not possible during the salvage excavation. This arrangement of structures situated around a central working area is similar to arrangements of tents in a campsite, as well as to the earliest composition of structures at Çayönü (Özdoğan 1999: 43). At Çayönü, however, the central working area was only 4-5 m in diameter, while that at Hallan Çemi was over three times as large (43). The structures themselves resemble the curved footings of tents built by modern nomads to protect against wind and cold (Cauvin 2000: 192, Fig. 67).

Building Level 2

In the second building level there are more structures around this depression, and with smaller openings. The types of structures, however, are essentially the same. Some of the structures in the second building level appear to be rounder in shape. The only addition is a paved floor, which I shall return to in more detail. There is nothing to suggest that the buildings were being used for different purposes than before. It is only in the most recent building level that a concerted effort is made to contain a group of people. A new form of architecture is observed: a building you must step down into. This is similar to the shape of the central depression, and reminiscent of being protected in a mountainside glen.

Other possible uses for these structures include storage and workhouses. Rosenberg noticed that no pits for storage were evident, and hypothesized that the plaster expanses were used as such. The smaller and earlier structures could have been used for storage of plant food, and indeed plant food remains are found associated with these buildings more than the large rooms of the final building level (Rosenberg 1994b: 81). Perhaps none of these structures were used as houses until the winter snow, when the inhabitants may have been far away. Natufian settlements have pits.

A building with a paved floor is again seen at Çayönü, albeit in the third building stage (later PPNB) (Özdoğan 1999: 51). Even the plastered floor has an analogue during the end of the round house phase there (Özdoğan 1999: 43). The floors and walls of structures during the Middle phase at Nemrik 9 were plastered

with clay, and (unlike Çayönü) pits and hearth were dug into the floors in all levels (Kozlowski and Kempisty 1990: 532-353).

Building Level 3

The larger, more circular structures found only in the most recent level at Hallan Çemi have similar shapes and sizes as those found during the Iraqi PPNA at Nemrik, Mureibet and Gilgal (Kozlowski 2006: 43). These are quite similar to the base-wall circular structures of the hunter-gatherer camps of the European Gravettian[4], in that the sizes of the villages, the number of houses per village and the great quantity of lithic material recovered are similar (50).

These larger buildings might have instead acted as workrooms, for the larger structures have the largest obsidian cores, as well as concentrations of chipping debris. On the basis of this, Rosenberg proposes that the larger buildings were public (1999: 27). There is much discussion of "public" activity in the literature, yet when groups are small families, it would seem as though most activity is public. Public/private only becomes an issue when single-family groups are no longer.

Only by the most recent building level is the assumption that buildings were meant for permanent habitation acceptable. Increased planning evident from the shaped sandstone used for structures and the gaps for roof support indicate that life focused more on existence within the area.

Another point of departure from the previous building levels is the placement of an aurochs skull that, due to its "nose-down" position, may have fallen

[4] The Gravettian is an Upper (late) Paleolithic industry that takes its name from a point type. The Gravettian of Eastern Europe is roughly analogous to the end of the Levantine Epipaleolithic

from a rafter or wall in structure A (Rosenberg 1994: 125). The position was such that, if it had been hung on the north wall opposite the entrance, it would have been the first thing seen upon entering the structure. This use of prominently-placed horned skulls is seen at, most famously, Çatalhöyük, but also in the PPNB and PPNC Skull Buildings of Çayönü (Özdoğan 1999: 52). At Jerf al-Ahmar, just north of Mureybet, several aurochs skulls were found in a 9th millennium BC (PPNA) level, having fallen from the wall of a round building 4 m in diameter (Akkermans and Schwartz 2003: 55).

Tents

Modern analogues show nomadic populations in the process of becoming sedentary creating permanent structures with an open side, to which their tent was affixed, often as a roof or porch. Modern tent-dwellers often set up their temporary structures adjacent to abandoned walls or corners (Cribb 1991: 150). Structures F and G have no apparent entrance. If one side of these two didn't go all the way up, perhaps only one or two courses of stones or mudbrick acting as a threshold, this would certainly point to a population using mostly temporary structures. Although collapse patterns indicate that these larger structures were roofed, it is not unlikely that temporary structures be roofed, as is shown by modern transhumant architecture. After all, winter is cold and precipitation puts out fires. Other kinds of support or reinforcement for tents would not likely be preserved.

The tent itself was also the inspiration for the round house shape (Schirmer 1990: 375). Perhaps there is a direct connection between tents and round structures

at Hallan Çemi. A tent could easily have been set up as a shade between buildings E and F of the middle building level. This space between the older structures may have attained a special significance for, in the following building level, it is occupied by one of the large rooms.

Floors

In the lowest building level, the concepts of both shelter and floor-space are evident. The irregular plaster surface near structure L demonstrates the need for a clean, level floor area. And yet the insides of these structures are unpaved. Thus, it is only in the second building level that we see the floor-space moved inside the shelter. The need for working areas was great enough for the external platforms and hearths not to disappear once the floor was moved inside. Another possibility is that each feature is the result of a different population's inhabitation.

During the second building level we see an intrusion into the floor: the internal plastered pit. In the final building level the idea of a malleable working area has been extended out of, instead of into, the tidy floor.

This association of working area and clear, flat area may be behind the "benches" of the large rooms, which may have been used instead as tables. The presence of such benches may not be solid support for the theory that these buildings were specialized "cult" areas. The act of worshipping has only very recently morphed into a calm, organized and seated activity.

Conclusion

I have described the architectural layout of Hallan Çemi in order to explore the possible uses of structures, their associations with one another and how this might relate to the dating of the site. As there were only a few seasons of salvage excavation, some questions may remain unanswered. It seems, on the basis of the architectural evidence, that Hallan Çemi was inhabited by a mobile group or groups, for the permanent structures are similar to those used as base camps by hunter-gatherers, sedentary or otherwise.

Whether Hallan Çemi was permanently settled has no bearing on the fact that it was identified as a place. It was a place with significance, whether spiritual (as the later "temples" at Nevalı Çori and Göbekli Tepe), or residential or some combination of the two; a protected place. Carvings, whether architectural or utilitarian, may have added to the protection afforded by the place.

Epipaleolithic peoples that used permanent structures have been discerned in the Natufian period of the Levant, in the middle Euphrates, and in the Caucasus Mountains. For the thousands of years during which the process of gradual Neolithization took place, much of Eurasia was still home to wandering bands. Those in the mountains tended to remain in fringe communities, and retain their Epipaleolithic lifestyle far longer (Sherratt 2006a, Kozlowski 1999: 25). The lack of technology associated with pottery from Hallan Çemi indicates that the populations there were either resistant to new technology, or had limited interaction with less conservative peoples. Certain semi-nomadic people used two kinds of structures; a summer tent, and a more permanent winter dwelling. The modern analogue are the

Turkish yaylacılar, who live in black goat hair tents during the spring and summer, and return to their more substantial homes in the autumn to secure the structures for winter.

As there was no evidence for solid building besides base walls, it seems the building style in general is closer to that of the European Gravettian than the Natufian. The light walls and roof, coupled with less than six total structures is quite similar to what is seen at sites like Bergumermeer B or Dolni Vestonice (Kozlowski 2006: 50).

The lowest level at Abu Hureyra is dated to the late Natufian period. Architectural remains consist of shallow depressions and myriad postholes (Akkermans and Schwartz 2003: 29). The relation of the small pits implies that they were joined together, but there is no evidence for stone base walls (29). The PPNA levels at Mureybet are characterized by round or oval huts made of packed mud with a foundation of boulders (Akkermans and Schwartz 2003: 50). These buildings had packed clay floors, but no internal hearths, and were connected by gravel pathways (50).

Architecture from the Zarzian Epipaleolithic is scant, as from the B1 and B2 levels of Shanidar cave there are pits lined with flat stones and stone pavements or platforms (Peasnall 2000: 99). There is also only one, roughly circular building inside (99-100). There are also a few arc-like low structures of stone at both Zawi Chemi Shanidar and Shanidar cave (80).

Thus the architecture from Hallan Çemi resembles neither the Natufian nor the Zarzian, but the building material is much more similar to that used in the

Zarzian. When compared to Aceramic Neolithic sites such as Nemrik 9 and Çayönü, the architectural resemblance is striking. As such, all three of these sites have been classified by Peasnall (2000) as belonging to the "round-house horizon," or a group with a common architectural *koine*. Another indication that the occupation did not take place during the Epipaleolithic is the use of lime plaster, considered by some to be a hallmark of the Neolithic (Akkermans and Schwartz 2003: 46). The presence of an aurochs skull inside a round building also has obvious connections with the PPNA of the middle Euphrates and central Anatolia.

It seems, then, that architecture can be used to resolve the problem of dating, but only if there is a quorum of firmly dated sites for comparison. A related issue is whether the architectural forms expressed by a population were indigenous, or adapted to fit their particular environment. The outstanding conditions at Hallan Çemi, such as the powerful catabatic wind and the natural abundance seems to suggest that any peculiarities may have been adaptations to their circumstances.

CHAPTER 5

SEDENTISM AND DOMESTICATION

This chapter will attempt to describe and assess the evidence for animal domestication by a fully settled community at Hallan Çemi, as both sedentism and domestication are considered part of a Neolithic economy. These issues deserve examining because, due to evidence from radiocarbon dating, these people would be the earliest to have practiced animal husbandry, and this at a location north of the generally accepted regions for the onset of animal domestication. The pig, though domesticated later, was not one of the first species to be manipulated by humans. The disparate areas where evidence of pig domestication first appears (around 6500 BC) were Southeast Europe and the Zagros Mountains (Flannery 1982: 182-3). The second embedded issue is that the people at Hallan Çemi lived there year-round. These claims are tied together by the proposition that pigs were domesticated. For, in order for pigs to have been domesticated, a sedentary population was necessary.

However, both the claims of sedentism and domestication are supported by gigantic extrapolations from small amounts of biologic remains. In order to evaluate these claims, I will first evaluate evidence for the six indicators of domestication developed by Bökönyi and then discuss the other proofs offered by Rosenberg. In like fashion, I will describe theories and possible indications of sedentism, describe the excavator's claims and then evaluate both.

Domestication

The process of animal domestication involves a change of focus from the dead animal to the living one (Meadow 1989: 81). Sometimes, clues that this process was taking place can be found in the archaeological record from a site. The indicators of prehistoric animal husbandry were set out in the widely-accepted paper by Bökönyi in 1969, and summarized by Meadow twenty years later (1989: 82). There are six types of evidence that are used to support arguments for the domestication of a species at a site. These are: presence of objects associated with keeping animals, artistic representations of domesticated animals, morphological changes, sudden appearance of animals without wild ancestors in the region, proportion of ages different from what is normally found in the wild, and proportion of sexes different from what is normally found in the wild.

The evidence cited by the excavator of Hallan Çemi in favor of early domestication of *Sus scrofa* are: a high percentage of pigs did not survive past one year (43%), the sex ratio is biased towards males and the pigs were butchered at the site (Rosenberg 1999: 31). Other supporting evidence is cited: pigs are

domesticated at nearby Çayönü, and one upper second molar was short enough to have come from a domesticated pig (Rosenberg et al. 1995: 5).

The faunal assemblage from Hallan includes more than 30,000 bones, of which 3,079 could be analyzed (Starkovich 2005: 15). Of these analyzed, 161 (excluding vertebrae and ribs) were identified as belonging to *Sus scrofa* (48). Of the long bones, a total of 10 tibia, 10 humeri, 5 radii, 9 ulnae, and three femurs could be identified (48). These remains, as well of those many other animals from the site, were analyzed to attain values for number of identifiable specimens (NISP), minimum number of individuals (MNI) and minimum number of elements (MNE). All of these help to determine the probable abundance in which these animals existed or had been exploited. The lowest level of analysis involves counting the remains that can be attributed to any one taxon. The species with the highest number of identifiable specimens were *Testudo graeca* (tortoise), *Ovis* (sheep), *Capra* (goat), *Cervus elaphus* (red deer) and *Sus scrofa* (pig) (16). Around 400 identifiable tortoise bits were counted, 560 combined sheep and goat parts, and 270 each deer and pig. All other species were represented by fewer than 100 identifiable specimens. NISP counts are influenced by identifiability: sheep and goats are virtually indistinguishable, and smaller species are more difficult to identify than larger ones. Because of this, the Paleolithic-type hunting strategies (emphasizing the slow-moving or the large) exhibited at Hallan Çemi could have been the result of interpretation, rather than actuality. Higher-level analyses such as MNI and the ratio of NISP to MNI show that a few species were overrepresented, and likely made up a higher percentage of the diet of the inhabitants of Hallan Cemi

(19). Of these overrepresented species, excluding ribs and vertebrae, the MNI of tortoise, red deer, and *Ovis*/*Capra* are greater than for pig (33).

Another type of analysis performed on the remains was the calculation of prey biomass. This is done by multiplying the MNI by an estimated body mass (Starkovich uses Silva and Downing 1995). This type of analysis is helpful, as different amounts of meat can be eaten from different animals, and the flesh of one cave bear feeds a population far longer than the flesh of one sheep. The results of this analysis (Starkovich 2005: 20 fig. 5) again show the usual suspects but reveal the far greater utility of cave bear and pig (19). Faunal analysis shows that the patterns of utilized animals at Hallan Çemi is consistent with an Epipaleolithic hunting economy.

Objects depicting domestication or associated with animal husbandry

There do not appear to be any objects associated with animal husbandry, nor the sudden appearance of species at Hallan Cemi. However, there are artistic representations of several different animals: canids, caprids, serpents, and possibly a pig. The artistic representations of animals recovered from Hallan Çemi include many species, but it is not clear from the representations whether these animals were domesticated or not. Thus, it seems that one depiction of a possible pig head on a sculpted pestle (Rosenberg 1994: 82) is insufficient evidence to claim that pigs were domesticated. In far greater numbers than the (probable) pig representation are images of goats. Yet there is no other evidence suggesting that these species were domesticated.

Morphology

Moving on to morphological evidence, there are two kinds that suggest domestication: the appearance of skeletal manifestations of pathological conditions brought on by confinement (such as arthritic goats at Tepe Sarab); and size diminution. However, as neither arthritis nor size diminution develops immediately, morphological evidence of domestication cannot be seen in the earliest stages of the domestication process (Meadow 1989: 85). Thus, if the pigs at Hallan Çemi were in fact showing signs of domestication, it was the result of a very long process. Measurable changes in the morphology of animals occur around the thirtieth generation (Bökönyi 1989: 25). As pigs mature young, every three or four years there is a new generation (25). Thus, Hallan Çemi would have had to be permanently settled, and pig taming practiced for about 100 years for any changes to have been evident.

The most common method of deciding whether a pig was morphologically wild or domesticated involves taking a measurement of the cheek teeth. Part of size diminution, a morphological attribute of domestication, is a shortening of the snout, which in turn leads to crowded teeth. The average size of the Near Eastern wild pig's cheek teeth is shorter then the European wild pig's, and for both species, the domesticated animal has even shorter teeth than the wild one (Flannery 1982: 170).

There are 3 components to variation in measuring any animal population: age-related change, sexual dimorphism and residual individual variation (RIV). Most age-related changes increase with age, with the exception of dental crown

heights (Payne and Bull 1988: 31). Some measurements are highly sexually dimorphic, and others are less so. For example, when measuring a canine tooth, it is important to know the sex of the animal, or the age could easily be skewed. It used to be thought that measurements of the 2nd and 3rd molars are most useful to determine whether pigs have been domesticated or not (Stein 1989: 91). However, due to the variations mentioned above, it is safer to measure the width of molars, rather than their lengths (Bull and Payne 1982: 36). Thus, the most accurate method of measuring dentition, in hopes of discovering whether a specimen was domesticated or not, was not utilized in the analysis of molars from Hallan Çemi.

At Hallan Çemi, three pig molars were recovered: 2 lower M3 which fell in the overlap between domestic and wild lengths according to standards set by Flannery for Near Eastern pigs; and 1 upper M2, which was just within the range for domesticated pigs (Rosenberg et al. 1995: 5).

Age Ratios

If the proportion of older to younger pigs is different from what is normally found in wild populations, the disparity may be attributed to a domesticated population. Herd management practices entail thinning the ranks in order to maximize return. This is especially evident in the practice of slaughtering young males. However, the comparison between wild and domestic populations is quite difficult when evidence exists for only one group. This sort of demographic argument is only pertinent when age and sex profiles for wild populations do exist: a very difficult task when dealing with prehistory (Meadow 1989: 83).

The age of an animal can be estimated from its teeth by occlusal surface wear patterns, dental crown heights, sequence of dental eruption and yearly growth increments visible on the roots (*cementum annuli*). Estimating the age based on dental analysis is easier than by estimating it based on epiphysial fusion, so long as there is at least a half-mandible. Such luck is not common among prehistorians. Isolated molars (more likely to be recovered in a Neolithic context) are also easily identifiable using dental analysis alone (Rolett and Chiu 1994: 385).

Another method of determining the age at which an animal dies is by examining the epiphyses at the end of long bones. The epiphyses fuse at different times in an animal's life. For example, the distal end of a humerus (above the elbow) fuses around the age of 12 months, while both the proximal and distal ends of the ulna (lower arm) fuse at about 3-3.5 years after birth.

Both tooth eruption and epiphysial fusion occurred more slowly in primitive pigs, and the timing of tooth eruption and epiphysial fusion differs among modern breeds as well (Bull and Payne 1982: 57, 70). Thus, conclusions based solely upon modern eruption or fusion data may be skewed with respect to past populations.

At Hallan Çemi, the pig survivorship curve was based upon fusion data. 10% of remains were less than 6 months old at time of death, 29% were less than a year, and 31% reached 36 months of age. The authors contend that these ratios are similar to other Near Eastern sites with domesticated pigs (Rosenberg et al. 1995: 6).

Based on fusion data, the entire spectrum of pig ages are present at Hallan Çemi, and the greater frequency of young pigs than young sheep or deer can easily

be explained by the difference in quantity of offspring of pigs, which is far greater than the number of offspring of other ungulates (Starkovich 2005: 34). Many cultures have enjoyed the taste of suckling pig, or roast piglet, and thus the presence of many young pigs need not be indicative of intentional culling. In sum, the range of pig ages from Hallan Çemi do not provide good support for the domestication of pigs.

Sex ratios

The other indicator based on disparate proportions relative to the wild population is the ratio of male to female animals. This may be indicative of a human population practicing culling of male animals. If a very high proportion of remains from a site can be identified as male, then this ratio must be compared with the natural proportions of the species. Determining the sex of an animal based upon skeletal material varies in difficulty according to species and element. Pigs do exhibit sexual dimorphism in the long bones and canine teeth, but almost hardly anywhere else. Again we must here take into account the size of the sample. From a total of 37 long bones: 10 tibia, 10 humeri, 5 radii, 9 ulnae, and three femurs, together from no fewer than two entire animals, (after Starkovich, table A3: 48) the distinction of a high proportion of male pigs was drawn.

Wild boars are typically found in sounders of around 20 animals: 2 or 3 females and their offspring. Males forage solo outside of the autumnal breeding season. In the absence of other evidence, it is nearly impossible to determine if the

remains of more males found because they were near the site foraging, or because they were being kept.

Butchery

The on-site butchery of animals can be taken as a criterion of domestication, as the animals were killed sufficiently close to the site to warrant the presence of the entire carcass, rather than transporting the most important pieces. Another explanation for on-site butchery is that those non-domesticated animals small enough to be transported whole were killed nearby. A typical kill site assemblage should have the results of primary butchery only: the skull, vertebrae and lower extremities, whereas a butchery waste or domestic midden should have the meat-bearing refuse: limb bones and ribs (Rackham 1994: 37).

The assemblage of Hallan Çemi showed that entire animals were frequently brought to the site, as many skulls were present in the garbage-replete central depression, as well as still-articulated parts (Rosenberg et al. nd: 3). Many of these recovered bones displayed damage from tools. Elements with more than 10% of the total exhibiting cutmarks are metapodials, humerus, radius, femur, calcaneum and astralagus (Starkovich 2005: 38). Astralagi and calcenei, bones of the extremities, may have been damaged in hide or bone removal, while the humerus, radius and femur are meat-bearing. Interestingly, pigs and red deer were butchered more roughly than sheep and goats, with more transverse cutmarks and splits in the bone (38). The reasons for this differentiation are unknown. Perhaps more transverse cutting was necessary on bones to be used for tools. If that were the

case, then there might have been a preference of pig and deer bone for making tools over that of sheep or goats.

Considering the advantageous position of Hallan Çemi, it is not surprising that many animals were butchered on-site. Animals migrating down the slopes or along the river had ample opportunity to find their way near the site. Thus, the practice of on-site butchery alone is insufficient evidence to claim that animals were domesticated, as a better explanation for the phenomenon exists.

Çayönü

As for claims concerning the nearby site of Çayönü, pigs had always been heavily exploited there (Hongo and Meadow 2000: 124). However, molar wear and epiphyseal fusion data show that more than half of the pigs survived well into adulthood. In addition to this, not a single third molar is below the mean length for wild pigs. Although some pigs may have been kept by the time of the Channel Building Phase (9100-9000 BP), these were allowed interaction with the free-ranging population (135). Therefore, using Çayönü in support of contemporaneous domestication at Hallan Çemi is valid only if the dating of Hallan Çemi is shown to be a thousand years too early.

Additionally, the site of Göbekli tepe is entirely wild through the PPNB. There is no evidence of either domesticated plants or animal husbandry (Hauptman 1999: 80).

Conclusion

There were no objects related to or depictions of animal domestication. The sex and age ratios cannot be compared to a wild population, and are themselves based on a very small sample. On-site butchery and the presence of young pigs can be interpreted in other ways. On the basis of the above, current opinion does not support the claim of pig domestication at Hallan Çemi (Akkermans and Schwartz 2003: 71, Savard et al. 2006: 184). Perhaps the best support for the claim that pigs were not domesticated is that the person who performed the faunal analysis found no clear evidence (Starkovich 2005: 45).

Sedentism

As with domestication, I shall describe theories and possible indications of sedentism, describe the excavator's claims and evaluate both. Boyd (2006: 165) suggests several indications that a population was fully settled. These are stone architecture, heavy duty material culture, storage pits, cemeteries, evidence for multi-season hunting, thick cultural deposits, and the presence of commensual fauna (165). We are reminded that these are indications that could support an argument in favor of sedentism, but do not necessarily do so (Kozlowski 2006: 48).

Among the evidence cited by the excavator in favor of permanent settlement at Hallan Çemi is seasonal availability of animals and plants as well as substantial architecture (Rosenberg 1999: 26). The strongest evidence comes from the valves (half shells) of *Unio tigridis,* or riverine clams (Rosenberg 1994: 83).

Clam shells

Clam shells are good indicators of seasonality if the ventral margins are intact enough that the last growth rings are visible. Not all of the 130 clamshells showed whether they had been killed in a season of slow or rapid growth. Sixty-three clam shells were preserved in such a manner that permitted analysis (Rosenberg 1994: 83). Eight were harvested in the summer and 8 in the spring. Twenty-seven died in the rapid growth phase of autumn, and 12 in the late fall or winter.

However, there is nothing that suggests the initial removal from the water was due to human species. Among the surviving faunal assemblage badgers, tortoise and medium birds certainly eat clams and are mobile. Foraging humans may have seen a half-clamshell in the dirt and brought it back to prepare as a piece of jewelry. The decorative function of clamshells is certainly known at Hallan Çemi: both Mediterranean gastropods and local *Unio* valves were pierced and used as beads or pendants (Peasnall 2000: 303-4).

Taking a single radial section of a ventral margin may not be the most efficacious method of analyzing valves, because a tangential section of all margins is not possible with the extant remains. The ventral margin, in some species, has fewer growth increments than the anterior and posterior margins (Hughes 1979: 736). This is because growth begins at the umbo (beak), on the dorsal end of the shell, and proceeds along the valve to the ventral margin.

The data from clamshells is therefore suspect, if one considers the method of analysis used in conjunction with the numerous predators on site.

Seasonal availability

The seasonal availability of other animals may also be used as evidence for a fully settled population. Seasonal activities such as birth and migration may indicate the time of year in which an animal died. However, it must be kept in mind that it is nearly impossible to distinguish between sustained harvesting (of plants or animals) throughout an entire season and several short collections by revisiting groups (Edwards 1989: 31).

The seasonal availability of plants and their possible uses across the seasons can be used to support the claim that a population was fully sedentary. Recently published archaeobotanical evidence from Hallan Çemi shows the range of exploited species as being highly diverse, and dominated by valley-bottom species. Of the 175 samples from Hallan Cemi that were analyzed, 36 came from the central depression area (Savard et al. 2006: 186). The total assemblage of seed and fruit remains is dominated by sea club-rush (*Bolboschoenus maritimus*) and dock/knot grass (*Rumex*/*Polygonum*). Other plants in a high percentage of the total include: mullein (*Verbascum*), vetches (*Vicia*) and Compositae (*Gundelia* and wild lettuce). Almonds (*Amygdalus*) and terebinth nuts (*Pistacia*) made up about 1% each of the total finds, but were found in more than half of all of the samples (187).

The assemblage is almost certainly misleading in some direction, as seeds may have been brought to the site along with the edible or desired part of the plant.

In addition to the seeds of the sea club-rush, the rhizomes (underground, horizontal stems that send out roots and shoots) can be collected in autumn and winter and dried. The root and leaves are also edible, and may have medicinal uses. There are over 50 species of dock/knotgrass recorded in modern Turkey. *Rumex* has edible leaves, and is widely-known in Britain as a cure for nettle stings. *Polygonum* shoots can be eaten like asparagus, and are also consumed by modern ruminant animals from February through July. The powdered rhizomes are sometimes used as laxatives. Mullein fruits have a huge number of tiny seeds, which may account for the high percentage but low ubiquity of their representation. Vetches are known for their large-seeded legumes, such as fava beans. Many, however, are toxic to animals with a single stomach (such as humans) and therefore more suited to the ruminants. Modern almonds are harvested midseason, but are very easily damaged by frost. *Pistacia* are more tolerant of cold. The terebinth nut is used medicinally and to make turpentine, and all parts of the plant have a very strong, resinous smell.

However, from seeds alone, it is difficult to tell whether the samples which were recovered came from kitchen refuse or from animal excrement. Also, seeds alone don't tell us how the plant was used, especially if the plant in question is not domesticated, or if other parts are tastier.

Stone architecture and rebuilding

As noted in the previous chapter, the presence of stone architecture need not imply a permanently settled population. Other architectural suggestions of

sedentism may be successive rebuilding or advanced settlement planning and organization.

Successive stages of rebuilding need not be by the same people who built the previous structure. Indeed, multiple renovations may indicate that successive populations have moved into a pre-existing structure (Kozlowski 2006: 49). New winter tenants may have personalized or purified a structure for their own use. Thus, multiple resurfacings of a floor may indicate when a new population or family group moved in.

As the number of extant structures is so small, very little can be said about settlement planning. It must be remembered that some European Gravettian settlements (25,000-15,000 BP), though designed by mobile persons, exhibited similar forethought in spatial usage (Kozlowski 2006: 48-9). It seems then that stone architecture, successive rebuilding, and settlement planning can not be used as justifiable criteria to claim that Hallan Çemi was fully settled year-round.

Heavy material culture

Heavy duty material culture from Hallan Çemi aside from querns is surprisingly absent, though this also does seem to be the case at many other roughly contemporaneous sites. Compared to other sites along the Taurus-Zagros arc, the only really obvious dearth is of celts and adzes, which are often used for hoeing or shaping wood. Many ground stone items were not exclusively used for food producing, as demonstrated by ochre on pestles and shaft damage. Heavy ground stone mortars, such as those embedded in floors, most certainly were not

transported from site to site. This does not preclude the use or existence of several campsites with embedded mortars. To say that heavy material was never transported would be absurd. Indeed, raw material was often transported long distances, as is evidenced by obsidian cores and bowl and quern blanks.

The absence of heavy duty material culture is another indication that the populations that lived at Hallan Çemi were at least semi-nomadic, especially in the light of mobile populations that left and periodically returned to base camps where their heavier goods were stored.

Storage and Burials

The absence of storage pits and cemeteries is indeed peculiar, and makes the site of Hallan Çemi even more interesting. The amount of energy required for digging graves and storage pits makes their presence a valid criterion for recognizing sedentism (Bar-Yosef 1998: 168). During the Early Natufian in the Levant, there are many pits dug into the ground, but very little evidence that these pits were used as agricultural storage. Level B of Shanidar Cave has pits, with dark soil and charcoal, but again, no direct evidence that they were used as storage. One pit from Karim Shahir had a hard-packed bottom and red ochre. Often pits were fire-hardened, and some had tools in them. The problem with assuming food was cached in storage is that it is almost necessary to have someone stay behind full-time to guard the stores. Thus, the absence of storage pits, or pits of any kind, leads one to the conclusion that the site was not permanently occupied.

In order to fulfill more criteria of sedentism it may be that Rosenberg suggested that the plaster expanses were floors for storage. However, lacking evidence other than speculation, it seems that pierced bowls either suspended from trees or rafters, or covered with hides were greater proof of storage.

The lack of cemeteries may mean that a site was only seasonally used, that a small population was buried offsite (as opposed to beneath the floor of a house), or that the settled area was incompletely excavated. Often mobile populations bury their dead in certain sacred places, returning to the same spot again and again as part of a ritual (Edwards 1989: 24). On the other hand, burial within residential sites is known from both permanently settled and fully mobile communities.

The idea of conceptual ownership and continuing relations with ancestors may have led to the idea of burying beneath floorspaces. Boyd (2006: 172-3) has suggested that certain Natufian peoples may have decided to stop their movement and build a house based upon a death. He points out that there is often no evidence that a floor was dug through in order to effect a burial, and concludes that the floor was built over the inhumation.

In conclusion, the lack of storage is better evidence for a transhumant population than a lack of burials.

Thick deposits

Thick cultural deposits, often cited as evidence for a permanently settled population, may be caused by periodic visits to the same location, flooding, or simply the increase of the population inhabiting a particular site. Kozlowski (2006:

43) points out that the exceptionally thick cultural deposits, like those at Gilgal and Netiv Hagdud, correspond to numerous occupations accumulating in a short time. Kozlowski also separates "thick cultural deposits" into thick deposits of various classes of items, presumably under the assumption that a thick deposit of chipped stone may outlast a thick deposit of vegetal material in certain conditions. In any case, the argument seems to be as such: thicker deposits are caused by an increase in population or in the number of populations at a given site. Determining which or both of these is the cause requires painstaking micro-stratigraphy. In the case of the salvage excavation at Hallan Çemi, this was not an option. Thus, determining whether the 2.5 m of cultural deposits were a result of repeated episodes of settlement, or one continuous episode of uninterrupted sedentary life, is something that cannot be determined.

Commensual fauna

The presence of commensual fauna as an indication of a sedentary lifestyle has been hotly debated since the early 1990's. The argument is that certain creatures are attracted to the refuse of human sites. However, commensual fauna such a pigeons, squirrels and mice can be present in nonsedentary campsites as well as in the wild. There is no reported evidence from Hallan Çemi of these animals, with the possible exception of "medium birds" (Starkovich 2005: 18). As such, the argument is irrelevant.

Conclusion

The Fertile Crescent entails the piedmont zones of the Taurus and Zagros Mountains, the upper Tigris and Euphrates of southeast Anatolia, and the central Anatolian plateau. It is within these diverse areas that the earliest evidence for agriculture and animal domestication exists. Different areas of the Fertile Crescent supported populations that variously adapted different strategies over thousands of years. Those in the wooded, mountainous regions were able to take advantage of a Broad-spectrum foraging strategy for far longer than populations at lower altitudes, and only made the transition to farming after 7000 BC (Sherratt 2006a: np).

The populations at Hallan Çemi were able to make used of a broad-spectrum strategy and continue their Epipaleolithic lifestyle. The sharp dichotomy seen today between settled and nomadic peoples may not have existed in the Neolithic. Instead of full-blown sedentism or mobility, the evidence could suggest a fringe population largely transhumant, returning to several impermanently occupied structures over the course of seasons or at whim. The lack of substantial architecture, storage and cemeteries points to a more mobile population, while the presence of thick deposits and resurfaced floors may be interpreted as evidence for both positions.

CHAPTER 6

RADIOCARBON DATING

The previous chapters have dealt with various topics pertinent to relative dating of Hallan Çemi. This chapter will be devoted to the processes involved in the absolute dating of Hallan Çemi: specifically, the method of radiocarbon dating. Radiocarbon is crucial to how a site is dated, and, therefore, how the site is conceptualized, but the process itself is not unproblematic. Radiocarbon is a complex process, as a number of factors are involved in both generating and interpreting the data. Thus, I will critically review the data concerning sampling, analysis, and interpretation through calibration. Most of the information in this chapter draws upon Stuiver and Polach (1976) and Higham (1999); all other references are noted.

Hallan Çemi

The radiocarbon samples from Hallan Çemi were run in 1992 and in 1994. All were processed at Beta Analytic Inc., and all were charcoal samples. In general, the samples processed later were more precise and not as early as the dates from previously-run samples.

Number	Date 1 sigma	Type	Year	Comments
Beta-46647	10,040 ± 160 BP	Charcoal	1991	fill below house floor
Beta-46649	10,800 ± 220 BP	Charcoal	1991	1.3 m down central area
Beta-47211	10,060 ± 120 BP	Charcoal	1991	1.3 m down central area
Beta-47252	11,700 ± 460 BP	Charcoal	1991	less than .3 g
Beta-47253	9, 730 ± 300 BP	Charcoal	1991	less than .3 g
Beta-55049	10,050 ± 80 BP	Charcoal	1992	
Beta-55050	9,840 ± 50 BP	Charcoal	1992	
Beta-55051	10,500 ± 170 BP	Charcoal	1992	
Beta-55052	10,590 ± 170 BP	Charcoal	1992	
Beta-56102	10,590 ± 260 BP	Charcoal	1992	less than .3 g
Beta-66850	9,510 ± 200 BP	Charcoal	1993	
Beta-66852	9,600 ±180 BP	Charcoal	1993	
Beta-66854	9,930 ± 110 BP	Charcoal	1993	
Beta-66855	10,060 ± 90 BP	Charcoal	1993	
Beta-66856	9,870 ± 110 BP	Charcoal	1993	
Beta-66858	10,320 ± 110 BP	Charcoal	1993	
Beta-67462	10,520 ± 190 BP	Charcoal	1993	
Beta-67463	9,890 ± 90 BP	Charcoal	1993	
Beta-67464	10,000 ± 80 BP	Charcoal	1993	

Carbon 14

C14 dating, or radiocarbon dating, is a process that measures the residual radioactivity of a sample, often by counting the C14 atoms remaining in a sample.

C14 is one of the three main naturally-occurring isotopes of carbon. The other two, C12 and C13 are stable. C14, however, is unstable, or radioactive, and decays at a known rate. C14 is created in the upper atmosphere when cosmic rays smash a neutron into a molecule of 14N. The reaction causes the nitrogen to emit a proton and becomes 14C. 14C is quickly oxidized and becomes $14CO_2$, which is found in all carboniferous plants and animals. Most carbon in living material is composed of C12, with minute percentages of C13 and C14. During the lifetime of a carboniferous being, C14 levels are regulated and kept consistent with the C14 of the atmosphere. Once the organism dies, however, the C14 slowly decays back into 14N. The rate of decay was first measured by Libby, Anderson and Arnold in 1949. After 5568 years, half of the C14 had changed back into N14[5]. 5568 years later, half of the remaining C14 was changed (that is, 11136 years after the death of the organism, 75 % of the C14 would have decayed into N14). By counting the remaining percentage of C14, it is possible to come close to the date at which the organism died.

Sampling

The preliminary reports make no mention of which levels any given sample may have come from. This is crucial information as the nature of a sample can affect the outcome of the dating. Often, the amount of carbon in a sample can be quite small after initial processing, which makes it more difficult to count. Though we are told that each sample came from charcoal, we know neither from which

[5] Since 1949, the half-life of 14C has been re-calculated, but 5568 is still used, and compensated for by calibration.

species the charcoal came, nor if the charcoal was the remnants of kindling twigs or structural timbers. One clue is given by Peasnall (2000: 134), who mentions a large chunk of oak charcoal with fat growth rings. Whether this piece was used for dating or not is unknown.

Pretreatment

Before any quantitative measures can be taken, pretreatment of the sample is necessary to remove any intrusive elements or contamination that might disturb the ratios of the carbon isotopes. Each sample may be subjected to different pretreatments based upon its original provenience. Physical pretreatments may involve chipping off the outer layer of charcoal or wood which may have come into contact with modern carbon, or removing tiny roots with tweezers and a microscope. After the initial physical pretreatment, samples are usually reduced in size by crushing or splintering before proceeding to chemical pretreatment.

The most common method for pretreatment of samples taken from the soil is the acid-base-acid method, in which a sample undergoes three separate pretreatments. One of the most ubiquitous contaminants found in samples taken from soil is carbonates absorbed from groundwater seepage. This is typically removed by the addition of HCl and boiling for about an hour. Afterwards, the sample is rinsed to reduce the pH and separated into acid-soluble and acid-insoluble portions. The acid-soluble portion should contain only the uncontaminated carbon.

Other common contaminants are humic acids and fulvic acids, both of which result from decomposing organic material. The fulvic acids are removed by

the initial HCl treatment, but the humic acids must be removed using a base-extraction method. Most commonly, the sample is combined with boiling NaOH for about an hour, then rinsed until the pH is again normal. The base-insoluble portion contains the carbon uncontaminated by humic acids, but unfortunately, during the base-extraction method, the NaOH may come into contact with atmospheric CO_2, thus necessitating the final stage of the acid-base-acid method: a second immersion into hot HCl and rinsing.

After a sample has undergone physical and chemical pretreatment, it undergoes combustion, which results in purified CO_2. Whether the sample will be counted using LS or AMS determines the following preparation steps. The CO_2 is collected and either chemically synthesized to graphite (for AMS), or is reduced to benzene, which is mixed with a scintillator.

Detection

Once the sample has been prepared, there are two different types of detectors that can be used. The counting occurs either with a liquid scintillation counter or an accelerator mass spectrometer. The basic method of each will be described below, but the main difference in result is that AMS allows for a smaller sample size and is more accurate for older samples.

LS counting requires that the carbon sample be dissolved into a solution of solvent and fluors. When the energy from a beta particle excites a fluor, the fluor emits a pulse of light which can be counted. Often, mixtures of solvent contain additives which makes the emitted light more easily detected.

AMS counting involves creating high kinetic energy between molecules to facilitate the differentiation between the mass of particles. The difference in mass between the C14 and the C12 isotopes is therefore made quite visible.

Counting

Radioactivity counting is subject to several kinds of interference during the process of counting. Radiofrequency interference, line transmission noise, static-induced noise, radon contamination, optical cross-talk and others all may contribute to skewed data. These are corrected for by a number of techniques.

At the same time as archaeological samples are measured, background samples are as well. This is a safeguard, for the activity measured in an infinite geological sample (such as coal or limestone) can be deducted from the unknown sample. When a final count has been established, the date is presented in years BP, or before the present.

Dates BP are measured against the IRDS, or International Radiocarbon Dating Standard. This in turn is based on the absolute radiocarbon standard, taken from wood felled in 1890. The reason behind this choice was that the onset of the Industrial Revolution altered the atmospheric radiocarbon reservoirs as fossil fuels were pumped into the air. The year 1950, corrected for decay (95%) from the 1890 timber, was arbitrarily chosen as 0 BP, or "the present". Thus years BP are years before 1950.

Calibration

Calibration is necessary to convert BP results to calendar years. BP years and calendar years do not correspond proportionally to each other, which results in the application of a "wiggly line." These wiggles are caused by "fluctuations in the heliomagnetic modulation of the galactic cosmic radiation" (Beta Analytic Inc. brochure: nd) and can cause anomalous results of hundreds of years. Longer term differences are caused by geomagnetic variations (Beta Analytic: nd).

The exact dimensions of the wiggles are still being debated and revised. This results in dates that were published in 1992 being calibrated by a different "wiggly line" than those published in 2007, yet nonetheless compared side-to-side.

The correlation curve for organic materials assumes that the material was living for exactly ten years (Beta Analytic: nd). While this may be appropriate for buckthorn trees or horses, it would be a very slender oak sapling indeed. Imprecision in the correlation data beyond 10,000 years is high, and must be considered as approximations.

To test the differences between calibration curves, I used two online programs (both of which followed INTCAL04) to calibrate the dates 10,590±170 and 9890±90. At two sigma, the range of dates for the older sample differed by only 9 years, but the range of dates for the younger sample differed by over 60! At one sigma, the dates recovered were identical: 10870-10427 BC for the older, and 9646-9254 BC for the younger. Then I put the same dates into an online equation using CalPal. The ranges attained at one sigma were 10736-10234 for the older,

and 9604-9302 for the younger. Which calibration curve is chosen most certainly affects the outcome.

Errors

Most artificial contaminants, such as human hair, cigarette ash or clothing fibers, as well as most post-depositional natural contaminants can be removed from a sample using the acid-base-acid method. There are other problems that are nearly impossible to solve, such as the inbuilt age and old wood problems. Any sort of wood that is dated incorporates an error due to inbuilt age, or the lifespan of the tree itself. Smaller errors are found in twigs and small sticks, or species that do not live very long. The "old wood" problem is similar; often wood used as charcoal was previously part of a structure, or had some other use before its final deposition as charcoal. In this case, any age determined by dating would provide the date at which the tree was cut down, not the time at which it was burned. The combination of these two errors can greatly skew dating results backwards.

Short-lived tree species present in the Hallan Çemi samples include willow, pistacio and possibly buckthorn. Longer-lived species include ash, oak, poplar, almond and terebinth. Of these, oak and terebinth are the longest-lived.

Statistical Analysis

Because it is not possible to measure all of the radioactivity in one sample, portions of the sample are counted and compared against each other. The resultant pattern is called a "normal distribution curve", within which it is expected that 2/3

of all counted values should be within one standard deviation from the averaged value. Every radiocarbon date is published with a standard error, or the plus/minus value obtained by counting statistics. By convention, dates are reported as ± 1 sigma. A more precise date will have smaller standard deviations, yet precision has no bearing on accuracy.

Conclusion

If the radiocarbon dates from Hallan Çemi are to be taken at face value, then the site should be place in the Epipaleolithic, and should be contemporary with Late Natufian and Zarzian Protoneolithic sites. However, I suggest that the processes of sampling, analysis and calibration are too easily skewed by error. In order to minimize error, I would like to see seeds, instead of charcoal run, and the subsequent dates should be reported at 1, 2 and 3 sigma, and each reported using multiple calibration curves.

CHAPTER 7

CONCLUSION

The main problem with the site of Hallan Çemi is that four different terms have been used to describe the time at which the site was occupied. Of these, two were generated by the excavator himself. To cope with these terminological discrepancies, let's first take the names at face value:

Epipalaeolithic – a term that denotes a hunter-gatherer subsistence economy but has no inference in terms of absolute dates. It does intimate a date towards the end of the Upper Paleolithic.

Protoneolithic – not a very common term, but used to describe an Epipaleolithic community which is conceptually even closer to the Neolithic.

Aceramic Neolithic – the first stage of the Neolithic, as first recognized in the Levant but also now known to exist in central Anatolia and Mesopotamia. The term infers an agricultural subsistence economy, but without pottery (which appears around 7000BC); it is quite a good term as it is culturally neutral.

PPNA – this term is arguably a particular form of the Aceramic Neolithic, in that it has recognizable material traits associated with the Levant. As such, by calling Hallan Çemi PPNA it is by definition claiming the site to be part of a larger Levantine world.

With the explosion of the Neolithic package (agriculture, sedentism, pottery, ground stone etc), whose components are now known to gradually appear over millennia, many now claim that it is the presence of agriculture that is the crux of what constitutes the Neolithic.

Taking this argument, Hallan Çemi should not be considered Neolithic, even though it has ground stone and huts (but so did Natufian people).

The other crucial argument in favor of Hallan Çemi being an Epipaleolithic site are the C14 dates, which, at face value, make Hallan Çemi contemporary with the Epipalaeolithic cultures of the Levant (Natufian) and the Zagros (the Zarzian).

The arguments for dating Hallan Çemi to the Aceramic or PPNA come from the artifact assemblage, and thus the terminological confusion. The ground stone assemblage is more complex than what is seen in the Natufian and Zarzian, and has closer parallels, both technologically and iconographically, to PPNA and PPNB

sites. The chipped stone and architecture are more complex than those of the Natufian or at Zawi Chemi Shanidar, and therefore, likely post-dated both.

My conclusions are as follows:

1) I do not believe the C14 dates, as evidence from lake sediments shows that such moisture as necessary to produce the thick rings of the Hallan Çemi charcoal remains did not exist during the 11th millennium BP. Also, the nature of the samples taken was not fully described in terms of which species of tree comprised the charcoal, and therefore, dating of shorter-lived specimens (such as seeds) is preferable.
2) On the basis of ground stone technology and iconography, intensive obsidian use, and aurochs skull placement, I claim Hallan Çemi was a late 10th / early 9th millennium site. As such, it is no longer contemporary with the Natufian and Zarzian but is instead a contemporary of the PPNA.
3) That said I disagree strongly that the site should be described as PPNA as there is no evidence for farming, and that there are too many dissimilarities with the Levant. This does a disservice to the local cultural expressions of Hallan Çemi to subsume it under an external regional terminology

So in sum, Hallan Çemi is a site contemporary with the PPNA to the south whose nearest contemporaries are Nemrik 9 and Çayönü, both of which are firmly placed within the Neolithic.

The problem in describing Hallan Çemi stems from the imposition of a developmental terminology, such as that the Epipaleolithic preceded the Neolithic in time. It makes no sense to suggest that by traveling to a site less advanced than your own, you are going backwards in time.

A far better way to describe the archaeology of this region would be to try and have a more neutral description of agriculturalists, pastoralists and hunter-gatherers of Upper Mesopotamia during the 11^{th}-9^{th} millennia BP.

In sum, I believe that Hallan Çemi represents a hunter-gatherer outpost surrounded by early farming communities. I do not have room to go into why these people did not jump on the Neolithic bandwagon, but it seems clear that the area was simply an advantageous ecological niche for hunter-gathering

There are parallels for this; not least the famous Balkan Mesolithic site of Lepenski Vir which it is now claimed existed in a Mesolithic oasis, surrounded by farming communities with whom they occasionally traded.

Of course this merely goes to remind us again that the process of Neolithization was a long term and complicated one, being neither universal nor immediate, and began far later in some areas than in others. Resistance to progress or change is an attribute of conservative populations such as hunter-gatherers and as such may be taken as support of the probability of such an outpost.

In order to further support this claim, it would be efficacious to survey tributaries of the Tigris between the Zab and Batman Rivers, in search of other possible “outposts” like Hallan Çemi.

Afterward: One week before the thesis defense, my attention was drawn to a new publication from Karlsruhe, in which evidence from Körtik tepe and Çayönü appear to bolster my ideas. Körtik tepe is dated to the PPNA, and is located in the Upper Tigris basin. The iconography on pierced ground stone bowls is very similar to that found at Hallan Çemi, particularly the wavy snakes with triangular-heads. Çayönü, it is now suggested, should be dated to the Epipaleolithic. While this seems to undermine my argument, it in fact supports it, as I claim that Hallan Çemi and Çayönü are contemporary.

SELECT BIBLIOGRAPHY

Akkermans, P.M.M.G. 1989. "The Neolithic of the Balikh Valley, Northern Syria: A First Assessment." *Paleorient 15:* 122-134.

Akkermans, P.M.M.G. and Schwartz, G.M. 2003. *The Archaeology of Syria.* Cambridge: Cambridge University Press.

Bar-Yosef, O. 1998. "The Natufian Cultures in the Levant: Threshold to the Origins of Agriculture." *Evolutionary Anthropology* 6: 159-177.

Bar-Yosef, O. 1994. "Form, Function, and Numbers in Neolithic Lithic Studies." Pp. 5-14 in *Neolithic Chipped Stone Industries of the Fertile Crescent*, ed. by H.G. Gebel and S.K. Kozlowski. SENEPSE 1. Berlin: Ex Oriente.

Baruch, U. 1991. "The Late Quaternary Pollen Record of the Near East." Pp. 103-119 in *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean.* Ed. by O. Bar-Yosef and R.S. Kra. Tuscon: Radiocarbon.

Bischoff, D. 2006. "Upper Mesopotamia 14C Databases: 11^{th}-6^{th} millennium Cal BC" http://www.canew.org/data.html

Bökönyi, S. 1989. "Definitions of Animal Domestication." Pp. 22-25 in *The Walking Larder: Patterns of Domestication, Pastoralism and Predation*. Ed. by J. Clutton-Brock. London: Unwin Hyman.

Bottema, S. 2002. "The Use of Palynology in Tracing Early Agriculture." Pp 27-38 in *The Dawn of Farming in the Near East.* Ed. by R.T.J. Cappers and S. Bottema. SENEPSE 4. Berlin: Ex Oriente.

Boyd, B. 2006. "On Sedentism in the Later Epipaleolithuc (Natufian) Levant" *World Archaeology* 38(2): 164-178.

*** 1994. "Public and Private, Domestic and Corporate: the Emergence of the Southwest Asian Village." *American Antiquity* 59(4): 639-665.

Bull, G. and Payne, S. 1982. "Tooth Eruption and Epiphysial Fusion in Pigs and Wild Boar." Pp. 55-72 in *Ageing and Sexing Animal Bones from Archaeological Sites*, ed. by B. Wilson, C. Grigson and S. Payne. Oxford: BAR.

CANeW (Central Anatolian Neolithic e-Workshop). 2004-2006. www.canew.org

Cappers, R.T.J., Bottema, S., Woldring, H., van der Plicht, H. and Streurman, H.J. 2002. "Modelling the emergence of farming: implication of the vegetation development in the Near East during the Pleistocene-Holocene transition." Pp. 3-14 in *The Dawn of Farming in the Near East.* SENEPSE 4. Ed. by R.T.J. Cappers and S. Bottema. Berlin: Ex Oriente.

Caneva, I, Iovino, M.R., Lemorini, C., Özdoğan, A., and D. Zampetti. 2001. "A Combined Analysis of Lithic Assemblages from Çayönü." Pp. 165-181 in *Beyond Tools. Redefining the PPN Lithic Assemblages of the Levant.* , Proceedings of the 3rd Workshop on PPN Chipped Lithic Industries (Venice, November 1998) Ed. by I. Caneva, C. Lemorini, D. Zampetti, and P. Biagi. SENEPSE 9. Berlin: Ex Oriente

Caneva, I., Conti, A.C., Lemorini, C., and D. Zampetti. 1994. "The Lithic Production at Çayönü: A Preliminary Overview of the Aceramic Sequence." Pp. 256-266 in *Neolithic Chipped Stone Industries of the Fertile Crescent*, ed. by H.G. Gebel and S.K. Kozlowski. SENEPSE 1. Berlin: Ex Oriente.

Cauvin, J. 2000. *The Birth of the Gods and the Origins of Agriculture*. Trans. by T. Watkins. New York: Cambridge University Press.

Cauvin, J., Aurenche, O., Cauvin, M-C., and N. Balkan-Atlı. 1999. "The Pre-Pottery Site of Cafer Höyük" Pp. 87-104 in *Neolithic in Turkey: the Cradle of Civilization*. Ed. by M. Özdoğan and N. Başgelen. Istanbul: Arkeoloji ve Sanat Yayınları.

Cribb, R. 1991 *Nomads in Archaeology*. Cambridge: Cambridge UP

Edwards, P.C. 1989. "Problems of Recognizing Earliest Sedentism: the Natufian Example." *Journal of Mediterranean Archaeology* 2: 5-48.

Flannery, K. 2002. "The Origins of the Village Revisited: From Nulcear to Extended Households."*American Antiquity* 67(3): 417-433.

*** 1982. "Early Pig Domestication in the Fertile Crescent: A Retrospective Look." Pp. 163-183 in *The Hilly Flanks and Beyond: Essays on the Prehistory of Southwestern Asia.* Ed. by T.C. Young. Chicago: Chicago UP.

Gopher, A. 1999. "Lithic Industries of the Neolithic Period in the Southern Central Levant: A Review." Pp. 116-138 in *The Eastern Wing of the Fertile Crescent: Late Prehistory of Greater Mesopotamian Lithic Industries.* England: Archeopress.

Hauptmann, H. 1999. "The Urfa Region." Pp. 65-86 in *Neolithic in Turkey: the Cradle of Civilization*. Ed. by M. Özdoğan and N. Başgelen. Istanbul: Arkeoloji ve Sanat Yayınları.

*** nd. "Upper Mesopotamia in its Regional Context During the Early Neolithic." CANeW

Higham, T. 1999. *The 14C Method*. http://www.c14dating.com/int.html

Hole, F. 1994a. "Khabur Basin PPN and Early PN Industries." Pp.331-347 in *Neolithic Chipped Stone Industries of the Fertile Crescent*, ed. by H.G. Gebel and S.K. Kozlowski. SENEPSE 1. Berlin: Ex Oriente.

*** 1994b. "Interregional Aspects of the Khuzestan Aceramic – Early Pottery Neolithic Sequence." Pp. 101-116 in *Neolithic Chipped Stone Industries of the Fertile Crescent*, ed. by H.G. Gebel and S.K. Kozlowski. SENEPSE 1. Berlin: Ex Oriente.

*** 1989. "A Two-part, Two-stage Model of Domestication." Pp. 97-104 in *The Walking Larder: Patterns of Domestication, Pastoralism and Predation.* Ed. by J. Clutton-Brock. London: Unwin Hyman.

Hongo, H. and Meadow, R.H. 2000. "Faunal Remains from Prepottery Levels at Çayönü, Southeastern Turkey: A preliminary report focusing on pigs (Sus sp.*).* Pp. 121-140 in *ICAZ Archaeozoology of the Near East IV A.* Proceedings of the fifth international symposium on the archaeozoology of southwestern Asia and adjacent areas. Ed. by M. Mashkour, A.M. Choyke, H. Buitenhuis, and F. Poplin. Groningen: ARC.

Hughes, W.W. 1979. "Growth Increment Consistency within Single Bivalve Mollusc Shells." *Journal of Paleontology* 53(3): 736-738.

Kenyon, K. 1952. *Digging up Jericho*. London: Ernest Benn.

Korfmann, M. 1973. "The Sling as a Weapon." *Scientific American* 229(4): 36-42.

Kozlowski, S.K. 2006. "The Hunter-Gatherer 'Villages' of the PPNA/EPPNB." Pp. 43-51 in *Domesticating Space*. Ed. by M. Chazan and T. Banning. SENEPSE 12. Berlin: Ex Oriente.

*** 1999. *The Eastern Wing of the Fertile Crescent: Late Prehistory of Greater Mesopotamian Lithic Industries.* England: Archeopress.

*** 1994a. "Chipped Neolithic Industries at the Eastern Wing of the Fertile Crescent." Pp.143-171 in *Neolithic Chipped Stone Industries of the Fertile Crescent*, ed. by H.G. Gebel and S.K. Kozlowski. SENEPSE 1 Berlin: Ex Oriente.

*** 1994b. "Radiocarbon Dates from Aceramic Iraq." Pp. 255-264 in *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean.* Ed. by O. Bar-Yosef and R.S. Kra. Tuscon: Radiocarbon.

*** 1989. "Nemrik 9, a Prepottery Neolithic Site in Northern Iraq." *Paleorient 15:* 25-31.

Kozlowski, S.K. and Kempisty, A. 1990. "Architecture of the PPN settlement in Nemrik, Iraq." *World Archaeology* 21(3): 348-362.

Kushnareva, K. 1997. *The Southern Caucasus in Prehistory: Stages of Cultural and Socioeconomic Development from the Eighth to the Second Millennium B.C.* Trans. by H.N. Michael. Philadelphia: University of Philadelphia Museum.

Libby, W.F., Anderson, E.C. and J.C. Arnold. 1949. "Age Determination by Radiocarbon Content: World-Wide Assay of Natural Radiocarbon." *Science* 109: 227-228.

Mazurowski, R.F. 1997. "Nemrik 9: A Prepottery Neolithic Site in Iraq. Volume 3: *Ground and Pecked Stone Industry in the PPN of Northern Iraq*." Ed. by S.K. Kozlowski. Warsaw: Zaklad.

Meadow, R.H. 1989. "Osteological Evidence for the Process of Animal Domestication." Pp 80-90 in *The Walking Larder: Patterns of Domestication, Pastoralism and Predation*. Ed. by J. Clutton-Brock. London: Unwin Hyman.

Moore, A.M.T., Hillman, G.C., and A.J. Legge. 2000. Village on the Euphrates: From Foraging to Farming at Abu Hureyra. Oxford: Oxford University Press.

Olszewski, D.I. 1994. "The Late Epipaleolithic Chipped Stone "Heritage" in Early Aceramic Neolithic Assemblages in the Northern Fertile Crescent." Pp. 83-90 in *Neolithic Chipped Stone Industries of the Fertile Crescent*, ed. by H.G. Gebel and S.K. Kozlowski. SENEPSE 1. Berlin: Ex Oriente.

Özbaşaran, M. and H. Buitenhuis. nd. "Proposal for a Regional Terminology for Central Anatolia." CANeW

Özdoğan, A. 1999. "Çayönü." Pp. 35-64 in *Neolithic in Turkey: the Cradle of Civilization*. Ed. by M. Özdoğan and N. Başgelen. Istanbul: Arkeoloji ve Sanat Yayınları.

Özdoğan, M. 1999. "Concluding Remarks." Pp. 225-236 in *Neolithic in Turkey: the Cradle of Civilization*. Ed. by M. Özdoğan and N. Başgelen. Istanbul: Arkeoloji ve Sanat Yayınları.

Özdoğan, M. and Balkan-Atlı, N. 1992. "South-East Anatolian Chipped Stone Sequence." Pp. 205-206 in *Neolithic Chipped Stone Industries of the Fertile Crescent*, ed. by H.G. Gebel and S.K. Kozlowski. SENEPSE 1. Berlin: Ex Oriente.

Payne, S. and Bull, G. 1988. "Components of Variation in Measurements of Pig Bones and Teeth, and the Use of Measurements to Distinguish Wild from Domestic Pig Remains." *Archaeozoologica* 2: 27-66.

Peasnall, B.L. 2000. *The Round House Horizon along the Tauros-Zagros Arc: A Synthesis of Recent Excavations of Late Epipaleolithic and Early Aceramic Sites in Southeastern Anatolia and Northern Iraq.* Ann Arbor: UMI.

Rackham, J. 1994. *Animal Bones*. London: British Museum Press.

Reimer, P.J. 2001. "A New Twist in the Radiocarbon Tale." *Science* 294. published online 6 December (10.1126/science. 1068023).

Rolett, B.V. and Chiu, M. 1994. "Age Estimation of Prehistoric Pigs (Sus Scrofa) by Molar Eruption and Attrition." *Journal of Archaeological Science*. 21(3): 377-386.

Rosenberg, M. 1999. "Hallan Çemi." Pp. 25-34 in *Neolithic in Turkey: the Cradle of Civilization*. Ed. by M. Özdoğan and N. Başgelen. Istanbul: Arkeoloji ve Sanat Yayınları.

*** 1994a. "A Preliminary Description of the Lithic Industry from Hallan Cemi." Pp.223-238 in *Neolithic Chipped Stone Industries of the Fertile Crescent*, ed. by H.G. Gebel and S.K. Kozlowski. SENEPSE 1. Berlin: Ex Oriente.

*** 1994b. Hallan Çemi Tepesi: Some Further Observations Concerning Stratigraphy and Material Culture. *Anatolica* 20: 121-140.

Rosenberg, M. and M.K. Davis. 1992. "Hallan Çemi Tepesi, an Early Aceramic Neolithic Site in Eastern Anatolia: Some Preliminary Observations Concerning Material Culture." *Anatolica* 18:1-18.

Rosenberg, M., Inal, N., and M.K. Davis. n.d. *Hallan Çemi Tepesi, an Early Aceramic Neolithic Site in Eastern Anatolia: Some Preliminary Observations Concerning Material Culture.* (ms donated to BIA by M. Rosenberg)

Rosenberg, M., Nesbitt, R.M., Redding, R.W., and B.L. Peasnall. 1998. "Hallan Çemi, Pig Husbandry, Post-Pleistocene Adaptations Along the Taurus-Zagros Arc (Turkey)." *Paleorient* 24(1): 25-41.

Rosenberg, M., Nesbitt, R.M., Redding, R.W., and T.F. Strasser. 1995. "Hallan Çemi Tepesi: Some Preliminary Observations Concerning Early Neolithic Subsistence Behaviors in Eastern Anatolia." *Anatolica* 21:1-12.

Rosenberg, M., and Redding, R.M. 2000. "Hallan Çemi and Early Village Organization in Eastern Anatolia." Pp. 39-61 in *Neolithic Farming Communities: Social Organization, Identity, and Differentiation.* Ed. by I. Kuijt. Kluwer New York: Academic/Plenum Publishers.

Rosenberg, M. and Togul, H. 1991. "The Batman River Archaeological Site Survey, 1990." *Anatolica* 17: 241-253.

Savard, M., Nesbitt, M. and Jones, M.K. 2006. "The Role of Wild Grasses in Subsistence and Sedentism: New Evidence from the Northern Fertile Crescent." *World Archaeology* 38(2): 179-196.

Schirmer, W. 1990. "Some Aspects of Building at the Aceramic Neolithic Settlement at Çayönü Tepesi." *World Archaeology* 21(3): 363-387.

Sherratt, A. 2006a. "The Origins of Farming in South-West Asia." *ArchAtlas* 2nd Edition, http://www.archatlas.org/OriginsFarming/Farming.php

*** 2006b. "The Obsidian Trade in the Near East: 14,000-6,500 BC." *ArchAtlas* 2nd Edition, http://www.archatlas.dept.shef.ac.uk/ObsidianRoutes/ObsidianRoutes.php

Solecki, R. and Solecki, R. 1970. Grooved stones from Zawi Chemi Shanidar: A Protoneolithic Site in Northern Iraq. *American Anthropologist* 72(4): 831-841.

Starkovich, B. 2005. *Faunal Data from Hallan Çemi Tepesi: A Late Epipaleolithic/Neolithic Transition Site in Southeast Anatolia*. Unpublished Master's Report, University of Arizona.

Stein, G. 1989. "Strategies of Risk Reduction in Herding and Hunting Systems of Neolithic Southeast Anatolia." Pp. 87-97 in *Early Animal Domestication and its Cultural Context*, ed. by P.J. Crabtree, D. Campana and K. Ryan. Philadelphia: MASCA.

Stuiver, M., and Polach, H.A. 1977. "Discussion: Reporting of 14C data." *Radiocarbon* 19(3): 355-63.

van Zeist, W. 1988. "Some Aspects of Early Neolithic Plant Husbandry in the Near East." *Anatolica* 15:49-67.

van Zeist, W. and Bottema, S. 1991. *Late Quaternary Vegetation of the Near East*. Wiesbaden: Dr. Ludwig Reichert Verlag.

Watkins, T., Baird, D. and Betts, A. 1989. "Qermez Dere and the Early Aceramic Neolithic of North Iraq." *Paleorient 15:* 19-21.

Wright, K.I. 1994. "Ground Stone Tools and Hunter-Gatherer Subsistence in Southwest Asia: Implications for the Transition to Farming." *American Antiquity* 59(2): 238-263.