



CHICAGO JOURNALS



Neolithization Processes in the Levant: The Outer Envelope

Author(s): A. Nigel Goring-Morris and Anna Belfer-Cohen

Reviewed work(s):

Source: *Current Anthropology*, Vol. 52, No. S4, The Origins of Agriculture: New Data, New Ideas (October 2011), pp. S195-S208

Published by: [The University of Chicago Press](#) on behalf of [Wenner-Gren Foundation for Anthropological Research](#)

Stable URL: <http://www.jstor.org/stable/10.1086/658860>

Accessed: 03/06/2012 14:37

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



The University of Chicago Press and Wenner-Gren Foundation for Anthropological Research are collaborating with JSTOR to digitize, preserve and extend access to *Current Anthropology*.

<http://www.jstor.org>

Neolithization Processes in the Levant

The Outer Envelope

by A. Nigel Goring-Morris and Anna Belfer-Cohen

The Near East is one of those unique places where the transition(s) from hunter-gatherers to farmers occurred locally, so it is possible to observe the whole sequence of these processes within the region as a whole. We discuss the archaeological evidence pertaining to those transformations within the Levant, presenting the particularistic local changes in settlement patterns and the character of the different communities juxtaposed with the landscapes and environmental background. The asynchronous developments clearly reflect the mosaic nature of the Levant in terms of specific local environmental conditions that influenced the scope and pace of Neolithization processes.

Introduction

The Levant is a distinct and limited area of the Near East characterized by its unique geographic location and the presence of a mosaic of different phytogeographic zones. There are few if any regions in the world where precipitation and vegetation zones vary so markedly over such small distances (Goring-Morris, Hovers, and Belfer-Cohen 2009 and references therein). It was against this unusual backdrop that the momentous changes from small groups of mobile foragers to large settled agricultural communities first occurred. These conditions need to be taken into account when considering Neolithization processes as a whole. Thus, in order to present as coherent a picture as possible, we here discuss and expand on the external issues pertinent to such developments. Belfer-Cohen and Goring-Morris (2011) explore the internal facets of these phenomena.

The region is also one in which relatively intensive field and laboratory research has been conducted, albeit still with significant “blank areas.” It is fascinating to observe the changes in the scientific approaches to Neolithization. These comprise early simplistic paradigms tracing the inevitable unidirectional “progress” (in a Marxist sense) from hunting-gathering to agricultural practices by means of a specific trigger such as climate change (e.g., Childe 1934). At the other end of the spectrum are complex multifactor approaches embracing demographic and social dynamics as well as quantitative and simulation studies (to name but a few, see, e.g.,

Bar-Yosef and Belfer-Cohen 1989; Bellwood 2005; Binford 1968; Boserup 1981; Cauvin 2000; Flannery 1969; Grosman 2004; Hayden 1990; Redman 1978; Rindos 1984; Verhoeven 2004; Watkins 2005). Yet many models suffer from a disregard of the basics, namely, that we are dealing with real people in real places and in real time. It is important to stress that developments appear to have been directional only in retrospect. The processes that took place were multifaceted, with various options available at the time; some of the choices, ultimately, were significant to future developments, but others were “sideshowes” or culs-de-sac in the evolutionary sense. Accordingly, within the archaeological record, we may stumble on evidence for both categories.

As we move through the chronological sequence, increasingly detailed information is available; of course, the question arises as to whether this evidence was present earlier and simply hidden by the foggy curtain of time. We are able to identify and isolate more archaeological entities—using traditional archaeological criteria—during the earlier Epipaleolithic than previously during the Upper Paleolithic. Yet even if the archaeological cultures differed in specific settlement patterns and cultural markers, the general nature of each such entity was quite similar. This similarity most likely relates to the obvious fact that all these groups were mobile hunter-gatherers exploiting their environments by similar means and in similar modes (Bar-Yosef 1981; Byrd 1990; Goring-Morris 1995; Henry 1989). Resources during the Late Glacial Maximum (LGM) varied from one region to another, reflecting local patchiness in availability and sometimes seasonality. Diachronic changes did occur, but, in general, the overall picture remained broadly stable. Within this frame of reference, gradual demographic increase during the Early and climatically ameliorated Middle Epipaleolithic would have led to locally increased packing in some areas following previous long-lived

A. Nigel Goring-Morris and Anna Belfer-Cohen are Professors in the Department of Prehistory, Institute of Archaeology, Hebrew University of Jerusalem (Jerusalem 91905, Israel [goring@mscc.huji.ac.il]). This paper was submitted 13 XI 09, accepted 12 XII 10, and electronically published 12 VII 11.

Table 1. Chronology of cultural entities in the southern Levant based on available radiometric date ranges

Dates BP Cal	Time stratigraphic units	Sociocultural entities	
		Mediterranean zone	Steppe and desert zone
24,000–21,750	Early Epipaleolithic		Nebekian
24,200–19,250		Masraqa (Late Ahmarian)	Masraqa (Late Ahmarian)
21,250–17,575		Kebaran	Kebaran
20,200–18,900	Middle Epipaleolithic	Nizzanan	Nizzanan
18,000–16,250		Geometric Kebaran	Geometric Kebaran
17,000–15,500			Classic Mushabian
16,850–14,400			Early Ramonian
14,900–13,700		Early Natufian	Terminal Ramonian Early Natufian
13,500–12,750	Late Epipaleolithic	Late Natufian	Late Natufian
12,500–11,750		Final Natufian	Harifian
12,175–11,800		Khiamian	
11,625–11,000	Early Neolithic PPNA	Sultanian	(Final Harifian)
10,950–10,300		Early PPNB	Early PPNB
10,150–9725		Middle PPNB	Middle PPNB
9400–8900	Early Neolithic PPNB	Late PPNB	Late PPNB
9050–8450		Final PPNB (PPNC)	Final PPNB (PPNC)
8400–7700		Yarmukian	Tuwailan
7750–7450	Late Neolithic PNA	Jericho IX	
7500–6500	Late Neolithic PNB	Wadi Raba	Qatifian Timnian

Note. There are slight discrepancies between this table and table 1 in Belfer-Cohen and Goring-Morris (2011). PNA = Pottery Neolithic A; PNB = Pottery Neolithic B; PPNA = Pre-Pottery Neolithic A; PPNB = Pre-Pottery Neolithic B; PPNC = Pre-Pottery Neolithic C.

Upper Paleolithic patterns (Goring-Morris, Hovers, and Belfer-Cohen 2009).

While, superficially, the observed changes during the earlier Epipaleolithic appear to have been incremental, gradually speeding up so that the pace of change eventually became logarithmic, common sense suggests that changes may more likely have been quite random, isolated, and independent. Obviously, we are limited by the very nature of the archaeological record. The changes would have involved technological innovations, differential social interactions, and responses to extraneous factors. Ultimately, it is the specific articulations of these various factors, internal (intra- and intergroup) and/or external (climate, carrying capacities, etc.) that are particularly relevant in terms of the nature and tempo of cultural change. This is one of the pitfalls of simulation studies, because they are based on consideration of long stretches of time and averaging out the data available. Actually, there are indications that at least at certain points in time, the course of events is more apt to be described in the mode of “punctuated equilibrium,” with periods of stasis interspersed by bursts of activity (and see below for specific examples). This pattern is reported from various parts of the world in the articles in this issue.

Another caveat concerns the very nature of the archaeological data as well as research paradigms that influence interpretations. The “rule of thumb” is that what is observed archaeologically more often than not reflects the end of the process (from invention to innovation to its wide acceptance), “solid” enough to be observed.

Considering all of the above, it transpires that the origins

and incipient processes of Neolithization in the Near East should be traced all the way back to the local Late Upper Paleolithic/Early Epipaleolithic. This corresponds to a chronological span of some 15,000 years (after calibration) until the end of the Neolithic, that is, the equivalent of some 500–600 generations (table 1).

The Geographic Setting

It is vital to define the geographic boundaries in which these processes occurred. The “Near (or Middle) East” is an ambiguous term that covers Southwest Asia between the Mediterranean and Iran. The region (Western Asia) encompasses Anatolia, the Levant, Cyprus, Mesopotamia, and Transcaucasia. Here our primary focus of study is the Levant, its most distinctive feature being its ecological diversity. In addition, where pertinent, we relate briefly to adjacent regions (e.g., Cyprus and central Anatolia). The Levant is a small region enclosed between the Taurus and Zagros mountains to the north, the Mediterranean coastline to the west, the Sinai Peninsula to the south, and the Syro-Arabian desert to the east, ca. 1,000 km north to south by up to 400 km east to west (fig. 1). The topography of the Levant is characterized by a north-south longitudinal series of alternating elevated and low-lying regions: the coastal plain and western piedmont; the central hill range reaching up to 2,000 m a.s.l.; the Dead Sea Rift lying below sea level; and the Trans-Jordanian/Syrian plateau (the central-south Levant), which rises steeply to elevations between 800 and 2,000 m a.s.l., followed by a gradual descent eastward into Saudi Arabia. Today there are relatively

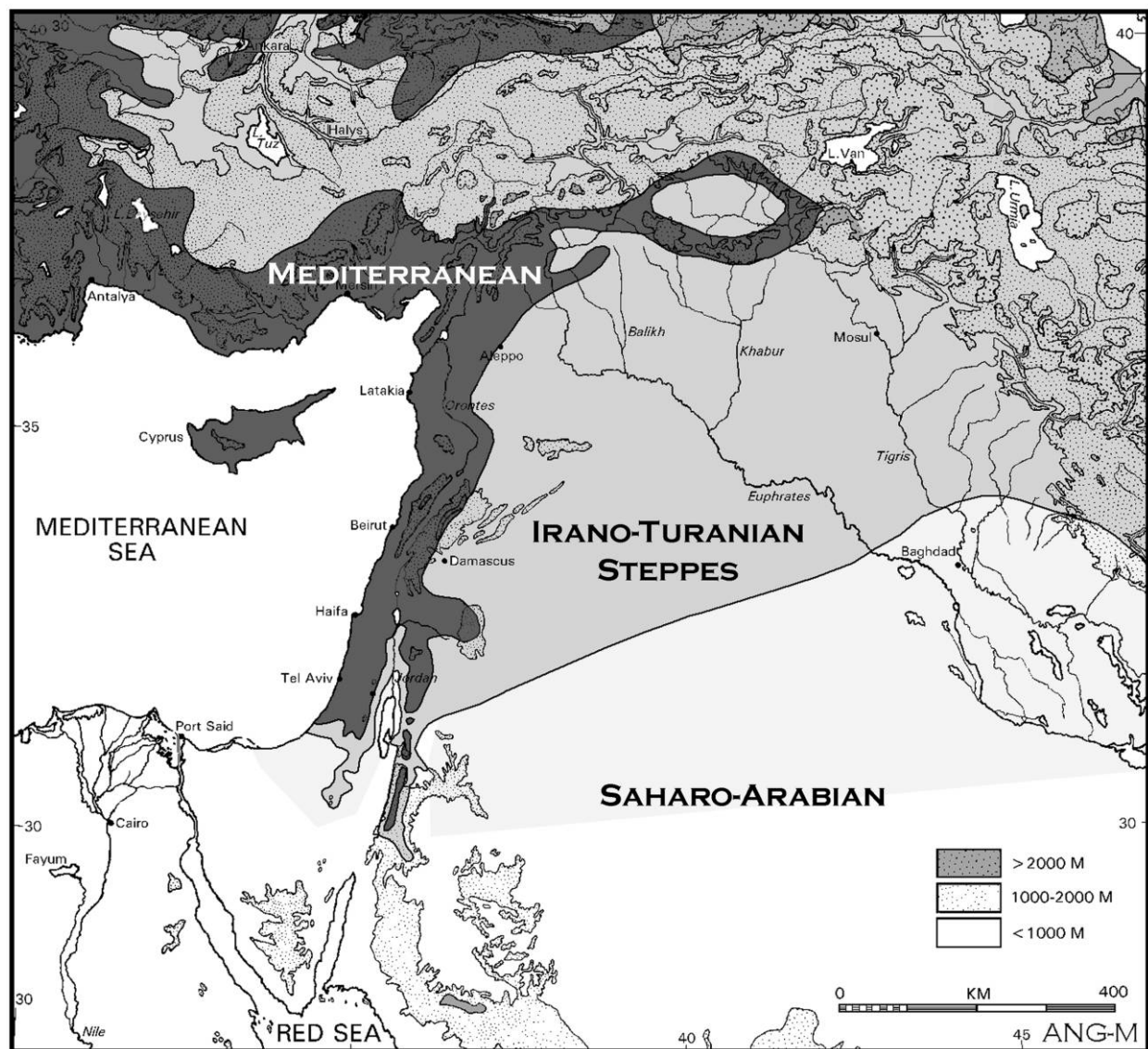


Figure 1. Phytogeographic regions of the Near East. The line between Beirut and Damascus differentiates between southern and northern Levant. Note that some relate the Upper Tigris as part of Mesopotamia while others include the Middle Euphrates as southeast Anatolia.

few perennial rivers or streams in the region, the most notable being the Tigris and the Euphrates in the north and the Orontes and the Jordan farther south along the rift valley. Almost all other drainages are seasonal and ephemeral. Changes in evapotranspiration rates were major factors in the presence and extent of Late Quaternary inland water bodies. Springs are common in the Mediterranean zone but are widely dispersed in more arid areas. Obviously, the specifics would have changed at various times, depending on the particular climatic conditions. It is important to stress that within the Levant, as indeed elsewhere, global climatic changes would have differentially affected environments at the micro- and macro-

regional levels. This is especially valid in comparisons between the southern and northern Levant. For example, Terminal Pleistocene/Early Holocene geomorphological changes appear to have acted differently in the north and the south, with more extensive aggradation in the north that may have caused the burial of sites there (e.g., Özdoğan 1997).

In this article, we use the term “southern Levant” to differentiate between the area south of an east-west line from the coast across to the Damascus Basin, as opposed to the “northern Levant,” stretching from that line north to the Taurus and the western end of the Zagros Mountains, including the Middle Euphrates and the Upper Tigris region

(sometimes called the “Golden Triangle”). Physical and cultural interactions are documented between the south and the north during the relevant periods; developments were not always synchronous, and centers of innovation appear to have shifted from the south to the north (but see Watkins 2008, concerning the so-called primacy of the southern Levant). Whereas in the past this geographic shift of the hub of Neolithization appeared to reflect more the history of research, it is less so the case today, notwithstanding ongoing lacunae in field investigations in certain areas.

The Paleoenvironmental Background

In order to begin to comprehend developments in human adaptations, it is vital to know the physical circumstances of the landscapes that populations occupied. This is especially applicable for areas such as the Levant, which comprises a particularistic mosaic in terms of environment and ecology. Such conditions would dictate fine-tuned adaptation by local populations to specific and frequently seasonal niches. Studies have demonstrated that climatic changes during the Terminal Pleistocene and Early Holocene fluctuated markedly, and rapidly and were often of an intensity hardly encountered during much of the Quaternary. We have in mind the time span from the LGM through the Bölling/Allerød, the Younger Dryas, and then to the Preboreal and the end of the Early Holocene Optimum (e.g., Bar-Matthews and Ayalon 2003; Byrd 2005; Enzel et al. 2008; Robinson et al. 2006; Wick, Lemcke, and Sturm 2003 and references therein). Particularly relevant for human populations would have been short-term annual or decadal climatic events, which are frequently lost in paleoclimatic reconstructions that tend to average out data over longer periods (Grosman and Belfer-Cohen 2002). These climatic shifts influenced vegetation and faunal distributions and densities throughout the region. The most marked influences, for better or worse, would have been at the interfaces/ecotones between the more mesic Mediterranean regions and the semi-arid peripheries. In terms of human adaptations, these changes would have resulted in “push-pull” or “concertina” effects, alternately bringing about retreats into refugia or enabling dispersals into newly opened-up areas. Reconstructions of specific human adaptations and subsistence should take those dynamics into consideration. Additionally, late Quaternary physical changes to the landscape were more marked in some areas (e.g., lower sea level at the height of the LGM and its subsequent rise) as well as the extent of lakes—the Dead Sea Basin and inland shallow lakes farther to the east (e.g., the Azraq, Damascus, el-Kowm, and el-Jafr basins).

Epipaleolithic Settlement Patterns

In addressing the issues of the Early and Middle Epipaleolithic (ca. 23–15,000 cal BP), consideration of the scale of social networks is crucial. Here the “magic” numbers of ca. 25 individuals for many mobile-band societies and 250–500 in-

dividuals for minimal sustainable mating networks should be emphasized (e.g., Johnson 1982; Kosse 1994; Wobst 1976). Site numbers, site sizes, and their relative durations through most of the Upper Paleolithic indicate that demographic increases were slow and incremental. Relative population densities began to grow starting with the Early Epipaleolithic; this rise in density was initially somewhat artificial, inflated by local environmental deterioration with the onset of the LGM that brought about declining carrying capacities in more marginal areas. Accordingly, populations congregated in refugia, so relative packing was greater within smaller areas while other areas were, to all intents and purposes, abandoned. In regions such as the eastern Trans-Jordanian steppes, groups could congregate seasonally in winter/spring because of the presence of large herds of the seasonally migratory subspecies of gazelle *Gazella subgutturosa subgutturosa* (Martin 1994, 2000; Muhesen and Wada 1995 and references therein). Later, during the Middle Epipaleolithic, significant climatic amelioration relaxed previous physical and ecological constraints, providing more and different stimuli to both local and overall population increases (see Grosman 2004 for additional references; fig. 2).

It is important to stress that, indeed, general trends varied from one geographical region to another throughout the Levant, as reflected by the numbers of sites documented. We also need to take into account the sizes and the duration of sites in attempting to reconstruct actual demographic increases. There are likely to have been major jumps in relative population densities within communities that we believe correlate with a combination of increasing sedentism (likely to induce shorter birth spacing) on the one hand and technological innovations (enabling more efficient exploitation of the environment) on the other. Clearly, these tendencies are apparent within the southern Levant from the Late Epipaleolithic Natufian onward.

With regard to developments in the northern Levant and adjacent areas, we remain in the dark for much of the Epipaleolithic (until the very end of that period). The few known sites are located in or at the margins of the mountainous zones, perhaps reflecting the geomorphological burial of sites in this region (and see above). Most of these sites were excavated 50 or more years ago, when stratigraphic control and excavation techniques were much less rigorous than today. Whether the apparent absence of pre-Pre-Pottery Neolithic A sites in more open environments reflects reality or the relative lack of systematic archaeological exploration and pedestrian survey remains unresolved.

Setting the Stage: The Natufian

The Late Epipaleolithic Natufian complex lasted for some 3,000 years (ca. 100–125 generations), with the Negev/Sinai local variant of the Final Natufian, the Harifian (Goring-Morris 1991), lasting a mere 750 years (<25–30 generations; Stutz 2004). It is crucial to differentiate between the various chro-

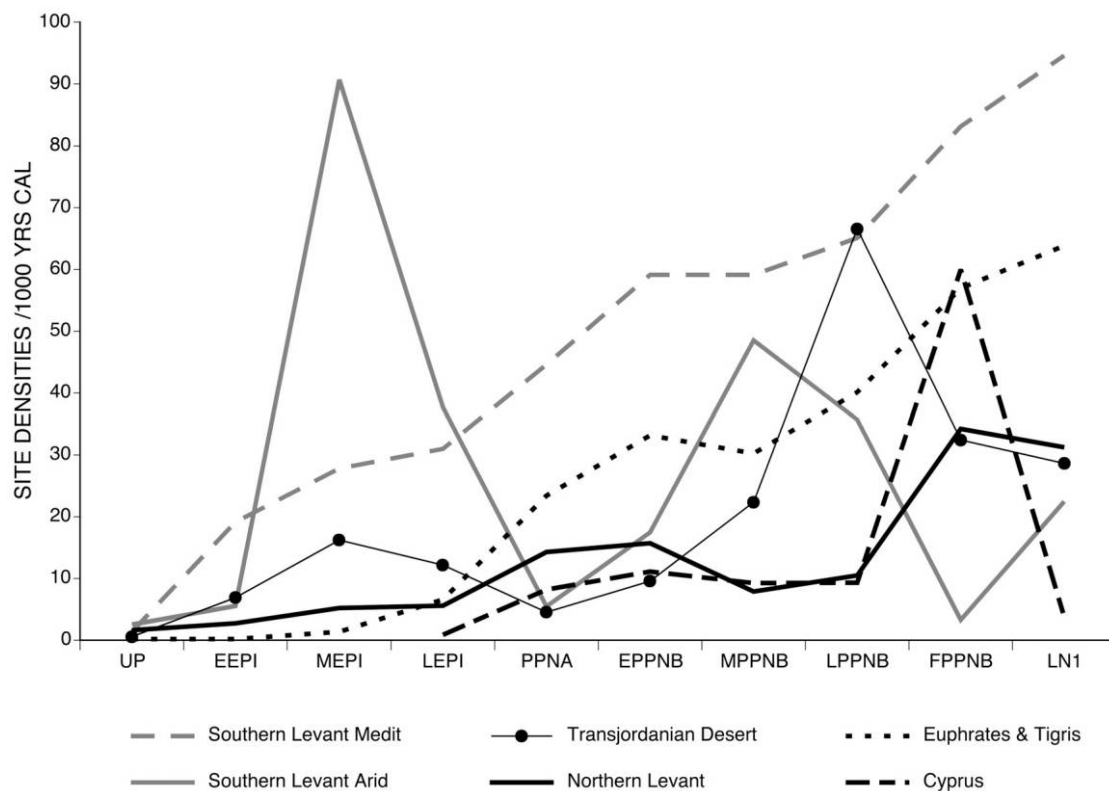


Figure 2. Changing site distribution densities in various areas of the Near East. Note that the differing longevity of each period is taken into account by presenting the relative number of sites per 1,000 years calibrated for each period (table 1). *EEPI* = Early Epipaleolithic; *EPPNB* = Early Pre-Pottery Neolithic B; *FPPNB* = Final Pre-Pottery Neolithic B (Pre-Pottery Neolithic C); *LEPI* = Late Epipaleolithic; *LN1* = Early Late (Pottery) Neolithic; *MEPI* = Middle Epipaleolithic; *MPPNB* = Middle Pre-Pottery Neolithic B; *PPNA* = Pre-Pottery Neolithic A; *PPNB* = Pre-Pottery Neolithic B; *UP* = Upper Paleolithic.

nological phases within the Natufian while also acknowledging the high degree of variability in specific Natufian adaptations at the regional level (Bar-Yosef 2002; Goring-Morris and Belfer-Cohen 1997; Valla 1999). In general, during the Late Epipaleolithic, a greater degree of differentiation between archaeological entities/cultures can be identified, as some groups became increasingly sedentary, incorporating technological developments on various levels (including those connected with food procurement and processing). This led to the beginnings of the dichotomy between “the desert and the sown”; thus, human groups with different economic modes of existence interacted differently with their environments.

When discussing the subsistence mode of the Natufian, we have to acknowledge the ranges of specific Natufian adaptations. While some groups were more or less sedentary in favorable ecological settings (e.g., on the shores of lakes or marshes), others likely practiced seasonal residential mobility,

and still others on the margins were even more mobile. Indeed, the Natufian is not just about the sedentary logistic collectors of the Mediterranean zone versus their (“poorer”) foraging cousins in the periphery, because there are also intermediate situations and interactions. Accordingly, the geographic scale of individual territorial ranges would have varied significantly, and a greater degree of packing of populations would have occurred within those areas settled by more sedentary communities.

Natufian subsistence modes were based primarily on the intensification of hunting and gathering and associated processing techniques. This is reflected in the exploitation of a particularly wide spectrum of faunal species coupled with the intense targeting of their preferred prey, the gazelle (see Munro 2004 and references therein). Although botanical remains are rarely preserved, the large numbers of groundstone utensils, especially mortars and pounding tools, clearly reflect more intensive plant-food preparation than previously (Bel-

fer-Cohen and Hovers 2005 and references therein). There is clear use of sickles for harvesting (whether wild cereals and/or reeds) during the Natufian, which has been suggested to imply more efficient methods of exploitation of smaller areas (Hillman and Davies 1992). However, the automatic association of composite tools—blades inserted in bone handles—with cereal harvesting requires caution, because few if any of the inserts actually display evidence for sickle gloss (Edwards 1991; Garrod and Bate 1937). It appears that while the Natufian does exhibit intensification of plant collection, there is no overt evidence for intentional plant cultivation. The reliability of claims for Late Natufian domestication of cereals at Abu Hureyra remains dubious, given the taphonomy of that site (Hillman 2000; Weiss and Zohary 2011).

Without delving into the specifics of social and mating networks operating during the Natufian here (see Belfer-Cohen and Goring-Morris 2011), suffice it to note that in some areas community sizes increased significantly, although the spacing between individual hamlets may have remained constant. The impact of the growth in community sizes and their observed territoriality is reflected in disparities between various components of the profane and symbolic material culture in the Natufian “core area” and more peripheral areas. Indeed, the quantum rise in the number of burials within “core area” Natufian sites, in areas clearly designated as burial grounds, undoubtedly reflects the increasing individual sense of “belonging” to specific localities and communities. Combined with this is the development of geographically wide-ranging exchange networks for both mundane (e.g., ground-stone utensils; Weinstein-Evron, Kaufman, and Bird-David 2001) and exotic (e.g., marine mollusks, greenstone, and other minerals; Bar-Yosef Mayer 2005) items, exchange that was previously at best sporadic (Goring-Morris 1989).

There are also indications for technological developments in other realms, including the beginnings of what can be termed “cottage industries.” This includes circumstantial evidence from the increased abundance and scope of bone tool assemblages for basketry and matting (e.g., Campana 1991; Le Dosseur 2008; Stordeur 1991; see also the isolated find, a wood and flax “comb” from Wadi Murabba’at; Schick et al. 1995). As for pyrotechnology, or “playing with fire,” in addition to increased lime-plaster production, we also witness technological developments with regard to fired clay and ochre (Belfer-Cohen 1988; Perrot and Ladiray 1988; Valla 1999; Zackheim 1997).

It is important to stress the documented diachronic changes in Natufian lifeways with explicit evidence for greater complexity during the early rather than the later phase. The Early Natufian displays a high degree of complexity and spatial organization, with large well-built structures that were surely occupied by units larger than nuclear families (Goring-Morris and Belfer-Cohen 2003; Valla 2008). Subsequently, there appears to have been a return to domicile by smaller social units in smaller structures. However, the bulk of the evidence for increasing mobility later on, during the Final Natufian, would

appear to result from external factors, especially the deleterious effects of the rapid onset of the Younger Dryas (Grosman and Belfer-Cohen 2002). Indeed, this is reflected most obviously in more marginal regions, such as the Negev and Sinai, with the finely tuned and short-lived Harifian entity. At the end of the day, conditions in these peripheral settings deteriorated beyond a critical threshold, and continued occupation of the area simply became untenable. There may have been no choice but to abandon the region and retreat to join communities elsewhere—whether in adjacent areas, in which the Final Natufians themselves were experiencing precarious conditions, or even farther afield.

In the northern Levant, broadly contemporary with the Late Natufian, a series of occupations have been described around the edges of the piedmont zone. This “Round-House Horizon” continues in time through the equivalent of the southern Pre-Pottery Neolithic A (PPNA; Peasall 2000). Adaptations in the north were based primarily on hunting and gathering of nuts and fruits. There have also been claims for some degree of management of wild boar (Redding and Rosenberg 1998; Vigne et al. 2011). While there have been claims for the initial occupation of Cyprus during the Late Epipaleolithic, the available evidence for pre-Pre-Pottery Neolithic occupation of the island to date remains equivocal and open to debate (Ammerman et al. 2006, 2007; Simmons 2001, 2007 and references therein).

Archaic Villages of the PPNA

The PPNA is a short-lived phenomenon with regard to both what preceded it and what succeeded it—a mere 1,000 calendrical years (or ~40 generations). However, the scale of change for the PPNA in the southern Levant is of a lesser order of magnitude compared with the northern Levant, where there was a rapid increase in population and in the accompanying elements of social organization. The arid margins throughout the Levant were all but deserted during the course of the PPNA and were recolonized only during the Pre-Pottery Neolithic B (PPNB).

The southern PPNA displays numerous elements of continuity from the Natufian. It likely represents the amalgamation of Final Natufian populations in locally favorable settings. This includes the Harifian, which represents Final Natufian refugees from the arid margins retreating into the Mediterranean zone because of the cumulative effects of the dire events associated with the Younger Dryas (Goring-Morris 1991). During the PPNA, conditions improved but appear to have been marked by torrential episodes (e.g., at Netiv Hagdud and perhaps also at Jericho; Bar-Yosef 1986; Bar-Yosef, Goring-Morris, and Gopher 2010).

Major PPNA sites in the southern Levant display a propensity for lowland settings in a north-south alignment, especially along the edges of the rift valley (and also along the eastern edge of the coastal plain). Smaller seasonal exploitation sites are found in a gradient up the neighboring slopes

to the west and to the east. A few sites, such as Jericho and Netiv Hagdud, are of a different order of magnitude, each encompassing areas of 1.6–2.0 ha, which may have housed up to a couple of hundred inhabitants. The scale of individually spaced oval semisubterranean residential units is indicative of nuclear family residences and reflected by the presence of grinding and pounding installations within each domestic unit (Rosenberg 2008; Wright 2000). Well-constructed external silos are found, although storage was probably also in baskets suspended from beams (e.g., Gilgal and Netiv Hagdud; Bar-Yosef and Gopher 1997; Bar-Yosef, Goring-Morris, and Gopher 2010). At Dhra, a raised silo is documented (Kuijt and Finlayson 2009), and at Jericho, what have been interpreted as larger “plastered” silos around the tower may indicate some form of community storage (Kenyon 1981).

Communal structures are few, with the exception of the enigmatic tower and wall at Jericho. Numerous interpretations have been proposed for their functions, ranging from the mundane (defenses against potential enemies or flooding) to the cultic (a ritual precinct and/or astronomical device; Barkai and Liran 2008; Bar-Yosef 1986; Crowfoot-Payne 1976; Naveh 2003; Ronen and Adler 2001).

Were these farming communities? While they probably practiced small-scale cultivation on the alluvial fans on which the settlements were located, the plant remains recovered were not always of species that were soon to be domesticated locally (e.g., oats *Avena sterilis* at Gilgal and Netiv Hagdud; Kislev 1997; Weiss, Kislev, and Hartmann 2006). There is some debate as to whether populations of medium-sized ungulates had already been depleted during the Natufian (Cope 1991 and Davis 1983, 1987 vs. Bar-Oz 2004 and Sapir-Hen et al. 2009), but there certainly appears to have been an increasing focus on smaller species, including birds (Horwitz et al. 2010; Tchernov 1994). The presence of silos may provide indirect evidence for surplus, which could have contributed to expanding exchange networks of foodstuffs. In addition, some sites appear to have served as nodes for procurement and exchange networks of valued materials (e.g., obsidian, malachite, salt, bitumen, seashells, etc.), which may have influenced their location and size. This may explain the otherwise anomalous location of the site of Wadi Faynan 16 in a marginal ecological setting at the edge of the rift valley (Finlayson and Mithen 2007) yet adjacent to abundant sources of malachite.

Coevally, in the northern Levant there was a veritable population explosion. This trend can already be detected along the Upper Tigris (the “Round-House Horizon”) toward the end of the local equivalent of the Late Natufian before the onset of the Younger Dryas (Peasnell 2000). Farther west, a linear riparian settlement pattern of communities developed at intervals of 20–25 km along the Euphrates and its tributaries. The settlement at Jerf el-Ahmar was initially very small but rapidly increased in size (D. Stordeur, personal communication). Recently, PPNA sites have also been reported

from the area between the Middle Euphrates and the coast (Abbès 2008; Mazurowski and Jamous 2001).

The northern intrasite pattern is one of dispersed small household units together with associated semisubterranean communal structures at sites such as Jerf el-Ahmar and Tell ‘Abr 3 (Stordeur 2007; Stordeur et al. 2001). The economy was presumably based on floodplain cultivation, but there is little if any solid evidence for domesticates until the end of the PPNA (Willcox 2005). Similarly, there is no unequivocal confirmation for animal domestication (for an overview see Zeder 2009, 2011). Hunting often appears to have focused on herd species such as *Gazella subgutturosa subgutturosa* and *Equus hemionus*, although in some sites wild boar *Sus scrofa* is also common and may have been managed and/or culled (e.g., Vigne 2008; Vigne et al. 2011).

These developments would have necessitated changes in the scale of mating networks, which can be tied in with the foundation of various ritual-cum-aggregation sites in watershed locations (e.g., the PPNA-B hilltop ritual site of Göbekli Tepe; Schmidt 2005, 2007 and references therein). Clearly, the nature of the relationships between the various sites, as well as between the northern and southern Levant and other areas, underwent transformation. Exchange networks were widespread, as exemplified by the systematic acquisition and use of Cappadocian and Bingöl obsidian, although no PPNA sites are presently documented near those sources (Delerue 2007). Here, it is interesting to note the similarity of the “southern” Harifian projectile points to the “northern” Nemrik projectile points; are we facing the beginnings of what will be the hallmark of “convergence” (i.e., the development of a PPNA koine—a regional interaction sphere sharing focal cultural characteristics—preceding the better-known PPNB one) and/or actual population movements? While the issue of the systematic colonization of Cyprus during the Late Epipaleolithic is open to some debate, it was clearly well under way during the PPNA (McCartney et al. 2007). Various lines of material evidence indicate that the origin of the colonists was probably from the north Levantine littoral to the Cilician plain. This likely reflects major demographic increases in that region.

The demise of the PPNA in the southern Levant displays little evidence for in situ continuity; most sites were abandoned, whether from overexploitation, declining yields, climate shifts, changing geomorphology, shrinking water sources, or other causes. One should also add the possibility of contagious diseases causing havoc at the local level, because the geographical scale of local interactions was still quite limited. By contrast, in the north there is unequivocal evidence for direct continuity from the PPNA to the PPNB, which commonly (but not always) took place on-site (e.g., Mureybet; Ibáñez 2008).

PPNB Village Society

With the emergence of PPNB village societies, the center of innovation had already shifted to the northern Levant. In the

southern Levant, the shift from PPNA to PPNB was quite abrupt, with the Early PPNB representing but a short bridging episode. So it is only with the Middle PPNB that we find the emergence of the full-scale PPNB koine that developed through the Late and Final PPNB. The koine stretched across the entire Levant and beyond, even incorporating central Anatolia and Cyprus (Bar-Yosef and Belfer-Cohen 1989; Cauvin 2000; Esin and Harmankaya 1999; Hodder 2007; Özdoğan 2011; Simmons 2007). It is important to note that this interaction sphere encompassed a wide spectrum of specific and varied adaptations. These included large-scale permanent villages based on farming and herding or hunting and farming and fishing, as well as mobile foraging groups and, toward the end of the period, pastoral societies (fig. 3). Because of the nature of local geographic zoning, these adaptations were all in close proximity to one another. The PPNB coincides with the Early Holocene Climatic Optimum (Byrd 2005), a time of plenty as conditions improved from one year to the next.

The southern Levant settlements were initially founded in a narrow corridor along a north-south axis on the western edge of the Trans-Jordanian Plateau (and to some extent the Jordan Valley) from Aswad to southern Edom along the later "King's Highway" adjacent to major wadi systems. These sites subsequently expanded to become the Late and Final PPNB "megasites," reaching up to 30 acres in extent (Bienert, Gebel, and Neef 2004 and references therein). The megasites were accompanied by complementary perpendicular settlement patterns along an east-west axis with much smaller sites. The north-south axis formed the basis for the main long-range exchange ("down-the-line") networks, the "megasites" serving as nodes for subsidiary distribution to the east and west (Goring-Morris, Hovers, and Belfer-Cohen 2009).

Still, there is little direct evidence as to the density of packing of architectural units within PPNB sites at any given point in time. This is obviously a crucial issue concerning estimations of village populations, which vary greatly. But, conservatively, communities at the top end of the scale numbered at least several hundred individuals (Campbell 2010; Kuijt 2000; Simmons 2007).

Economy displays considerable variability within the Mediterranean zone. Along the King's Highway and down in the rift valley, communities subsisted primarily on domestic cereals. But farther west, in the Carmel and in the Galilee, the emphasis was on lentils (e.g., Garfinkel, Kislev, and Zohary 1988). So, too, there are differences in the animals exploited. At Middle PPNB 'Ain Ghazal, a full 50% of the fauna was still hunted, a situation that changed dramatically by the Late PPNB, with 75% domesticated goats and sheep (Driesch and Wodtke 1997; Wasse 1997). But west of the rift—in the Galilee, Carmel, and Samaria—hunting continued to predominate throughout (Horwitz et al. 2000; Sapir-Hen et al. 2009).

With climatic amelioration, the desert margins of eastern Trans-Jordan as well as in the Negev and Sinai either were recolonized or relict populations increased significantly. The

way of life here was one of mobile foraging supplanted during the end of the period by pastoral nomadism, which seemingly originated in the Syrian Desert and then diffused southward and later westward (Bar-Yosef and Khazanov 1992; Betts 1998; Goring-Morris 1993).

Specialized sites were located in boundary or neutral geographic settings, serving most probably as cultic centers, aggregation sites, and/or mortuary sites, as, for example, Nahal Hemar cave in the Judean Desert and Kfar HaHoresh in the Nazareth Hills of lower Galilee (Bar-Yosef and Alon 1988; Goring-Morris 2005). In the north, settlement patterns continued to be largely linear, with a focus on the Euphrates and its tributaries (e.g., the Balikh) and sites usually located at intervals of 20–25 km from one another (about a day's walk away). The individual sites expanded significantly in size in comparison with those of the PPNA. The demise of the PPNB koine may reflect a combination of factors, including a rapid climate deterioration (the so-called 8.2-kyr event), the effects of some 2,000 years of farming without manuring (Bogaard 2005; Bogaard and Isaakidou 2010), local overexploitation of nonsustainable nearby resources (Rollefson and Köhler-Rollefson 1989; but see Campbell 2010), outbreaks of contagious diseases, and increased tensions between neighboring communities (Goring-Morris and Belfer-Cohen 2010).

Discussion

Although most of the above represents a synopsis of hard-core data, there are points of debate regarding their interpretation and/or incorporation within the evolving matrix of the Levantine Neolithization process. Pertinent among them are the following.

Issues of continuity. Contrary to what was believed during earlier days of research, it transpires that there is no linear development from the Epipaleolithic to the end of the PPNB (e.g., Mellaart 1975; Perrot 1968). Each major period witnesses a breakdown, being separated from the next by a short-term yet major rupture, or "bottleneck," followed by realignment of the new system (i.e., the Early PPNA, the Early PPNB, and the Early Pottery Neolithic). However, it is important to stress that cultural complexes build on the past, sharing many common traits with their predecessors. They accordingly represent generational links within an extended family rather than a simple grandfather-son-grandson chain.

People or ideas in motion. For many years there was debate as to whether it was people or ideas that moved and dispersed from one area to the next. Currently, it is abundantly clear that both require consideration. Unequivocal examples of the former are the directed colonization of Cyprus and probably also of central Anatolia (e.g., Guilaine and Le Brun 2003; Özdoğan 2011; Peltenberg and Wasse 2004). The latter includes the diffusion of the bidirectional (naviform) chipped-stone technology from the Central Euphrates southward (Barzilai 2009; and see also Perlès 2005). The situation with regard to the diffusion of animal and plant domesticates within the

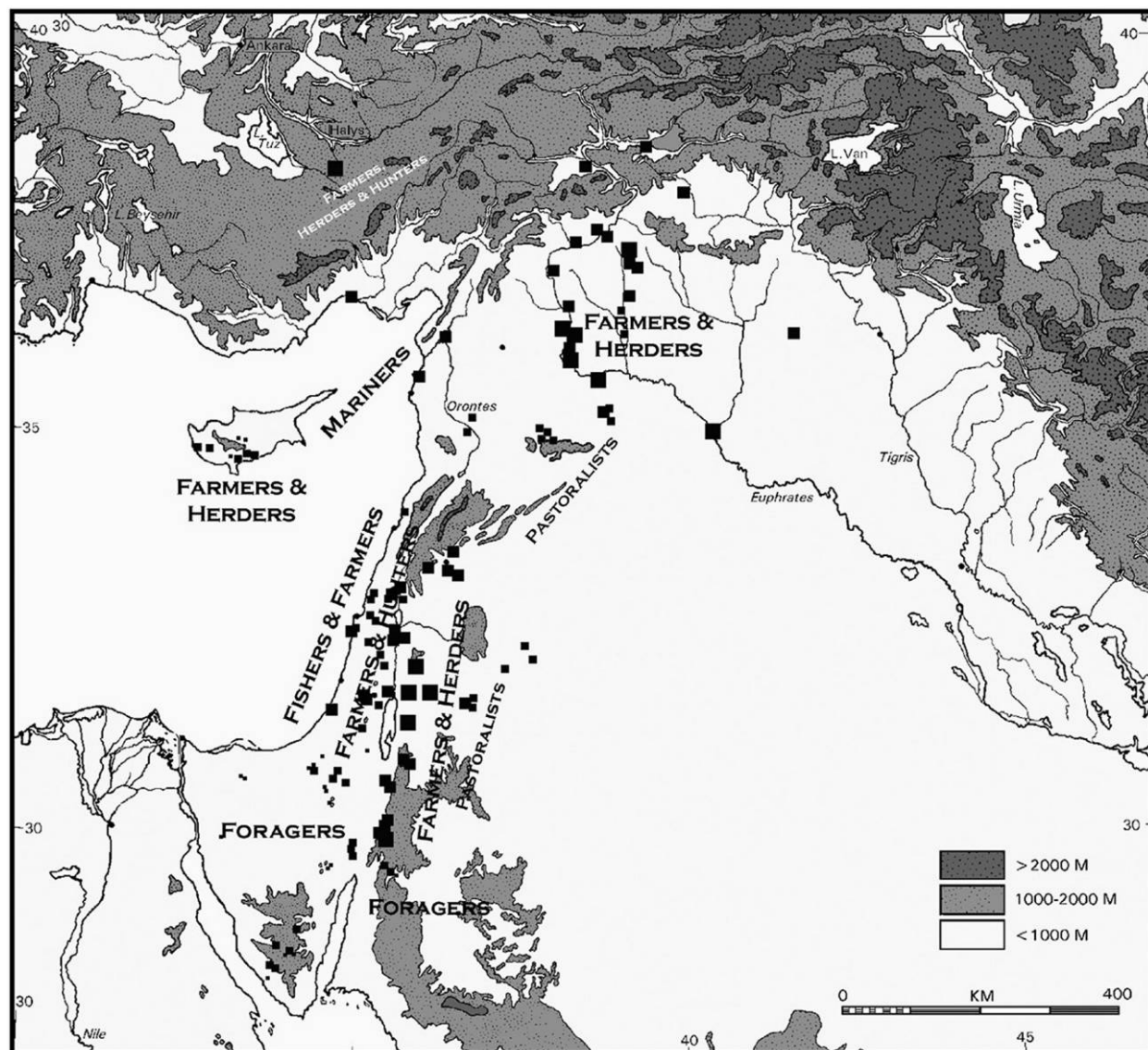


Figure 3. Pre-Pottery Neolithic B koine in the Near East, showing the wide range of economic adaptations throughout the region.

Levant remains uncertain and debated (e.g., Bar-Yosef 1998; Horwitz et al. 2000; Nesbitt 2002; Weiss and Zohary 2011; and see the never-domesticated animal species introduced to Cyprus in Vigne et al. 2011). Indeed, the apparent retardation in the diffusion of ideas across northern Sinai to the Nile Delta at a time of amelioration is an enigmatic example (Goring-Morris 1993; Smith 1989).

Population increase and demographic transition. Population increase and the Neolithic demographic transition (Bocquet-Appel and Bar-Yosef 2008) or, more recently, the agricultural demographic transition (ADT; Bocquet-Appel 2011) in the Near East are crucial in terms of the independence of the scale of mating networks. From the Early Epipaleolithic on-

ward, diverse types of mating networks are likely to have operated. Variability is especially relevant as individual communities became more sedentary and increased in size. Numerical thresholds were crossed, necessitating realignments in social intercourse within and between communities because previous social mechanisms were unable to cope with novel situations (and see Belfer-Cohen and Goring-Morris 2011). This makes it all the more difficult to predict or state when and where, precisely, the ADT occurred; should we start counting from the Natufian, the PPNA, or the PPNB?

Differences between developments in the northern and southern Levant. Was the southern Levant during the PPNB an independent center of innovation? Do developments in this

region simply reflect diffusion of novelties from the Euphrates region? Or are we witnessing combinations of both? Certainly, various facets of the material culture derive from the north, such as bidirectional naviform lithic technology. On the other hand, the evidence regarding the origins of domesticates is more equivocal.

The when, where, how, and why of plant and animal domestication. Archaeological evidence clearly demonstrates that there were more than two variants of economic existence; it was not just about farmers versus foragers. Fully fledged settled agriculturalists did coexist with hunter-gatherers during the Pre-Pottery Neolithic, but other groups, for a while at least, filled intermediate roles as forager-farmers so that there was a wide spectrum of lifeways (with the geographic distances involved being very small). Indeed, it is only toward the end of the Late Neolithic that subsistence throughout the region became based mostly on domesticated plants and animals (with the continuing dichotomy of agriculturists and pastoralists, as between “the desert and the sown”). This complexity should be acknowledged when we try to interpret the archaeological record, just as in the case of the rise of a new species. Even when we recognize the new species that will eventually replace its parent species, both the parent species and the offspring species coexist for some time, a simile to be aware of while deciphering the archaeological data at hand.

Plant and animal domestication processes. For how long was cultivation and animal herding practiced before their recognizable signatures in DNA, morphological changes, or age composition? What was the duration of plant and animal domestication processes? Domestication can be accomplished quite rapidly, but it seems more likely that initial Neolithic domestication in the Levant was a prolonged and undirected process. Not all those species that were intensively harvested and/or cultivated during the Early Neolithic were then domesticated (e.g., *Avena sterilis* and *Secale cereale*; Weiss, Kislev, and Hartmann 2006; Willcox 2005). And perhaps the same observations are valid with regard to the culling of wild animals (and see the situation in Cyprus with *Dama mesopotamica*; Vigne et al. 2011; Zeder 2011).

Prey stress, overhunting, and climatic changes with regard to animal domestication. Contrary to previous assertions that initial animal domestication focused on stocking the larder for meat, recently it has been claimed that the process was directed first at milk products (Vigne and Helmer 2007). Should we be looking at the central areas or the margins (and see Binford 1968, 2001; Flannery 1969)? Last but not least, we should bear in mind that domestication processes, whether of plants or animals, were intricately tied in with the non-material realms of human existence. Those promoted and encouraged the domestication venue, paced its tempo, or even arrested its progress. In short, one can be quite sure that the social realm controlled to a certain extent both the domestication processes themselves and their tempo and extent (and see Belfer-Cohen and Goring-Morris 2011).

Primary habitats and hearths of domestication. It has been

taken for granted that present-day distributions of the wild precursors broadly correlate with Terminal Pleistocene/Early Holocene patterns such that advances in DNA sourcing would enable the straightforward pinpointing of domestication localities (e.g., Heun et al. 1997; Kilian et al. 2006, 2007; Naderi et al. 2007). Others have argued for a single hearth of domestication for the whole package of founder crops (Lev-Yadun, Gopher, and Abbo 2000). Notwithstanding attempts to reconstruct late Quaternary distributions (Hillman 2000), current distributions of wild plants and animals surely have been affected by almost 10 millennia of agriculture and pastoralism. Furthermore, if domestication of plants and animals was a gradual process, then there are likely to have been considerable genetic interactions between the “predomesticated” but manipulated/cultivated species and wild populations. These interactions probably continued, affecting the genetic fingerprints of both the wild progenitors and the early domesticated forms.

If we take into consideration all of the above, the concept of Neolithization involved much more than plant and animal domestication, for Neolithization processes also involved the “domestication” of fire (pyrotechnological developments leading eventually to pottery production) and water (management in the form of wells and irrigation). Additionally, and of paramount significance, is social “domestication” with new means of molding community identity and interaction, whose very essence changed; these range from bonding through kinship, exchange networks, craft specialization, feasting, and so on, to rivalry, political boundaries, and intra- and intercommunity confrontational violence. Ultimately, the “Neolithic revolution,” in the Near East at least, was a long-term, incremental, and undirected process marked by significant threshold events, the outcome of which was by no means certain.

It is important to stress the novel nature of innovations associated with Neolithization processes. This is especially relevant when considering ethnographic analogies. Observed phenomena in the archaeological record mostly reflect occurrences that had “made it in the first cut” if not later on in the sequence. But, surely, there is also evidence of phenomena and innovations that ultimately did not pass the trials of time. We thus face amalgamations of both material culture evidence of what was ultimately successful and what fell by the wayside, as we discuss in Belfer-Cohen and Goring-Morris (2011).

Acknowledgments

We are grateful to the organizers (Doug Price and Ofer Bar-Yosef) and fellow participants of the Temozon Wenner-Gren workshop (Merida, Yucatan) in March 2009 for a most stimulating and intensive exchange of data and opinions concerning agricultural beginnings around the world. Thanks are due to the Wenner-Gren Foundation for the superb organi-

zation of the event and especially to Leslie Aiello and Laurie Obbink for their personal commitments to the success of the meeting. We also acknowledge the support of the Israel Science Foundation funded by the Israel Academy of Sciences (A. N. Goring-Morris: grants 840/01, 558/04, and 755/07; A. Belfer-Cohen: grants 855/03 and 202/05).

References Cited

- Abbès, F. 2008. Wadi Tumbaq 1: a Khiamian occupation in the Bal'as Mountains. *Neo-Lithics* 1(8):3–9.
- Ammerman, A., P. Flourentzos, R. Gabrielli, C. McCartney, J. Noller, D. Peloso, and D. Sorabji. 2007. More on the new early sites on Cyprus. *Report of the Department of Antiquities, Cyprus* 2007:1–26.
- Ammerman, A., P. Flourentzos, C. McCartney, J. Noller, and D. Sorabji. 2006. Two new early sites in Cyprus. *Report of the Department of Antiquities, Cyprus* 2006:1–22.
- Barkai, R., and R. Liran. 2008. Midsummer sunset at Neolithic Jericho. *Time and Mind: Journal of Archaeology, Consciousness, and Culture* 1:273–284.
- Bar-Matthews, M., and A. Ayalon. 2003. Climatic conditions in the eastern Mediterranean during the Last Glacial (60–10 ky BP) and their relations to the Upper Palaeolithic in the Levant: oxygen and carbon isotope systematics of cave deposits. In *More than meets the eye: studies on Upper Palaeolithic diversity in the Near East*. A. N. Goring-Morris and A. Belfer-Cohen, eds. Pp. 13–18. Oxford: Oxbow.
- Bar-Oz, G. 2004. *Epipalaeolithic subsistence strategies in the Levant: a zooarchaeological perspective*. American School of Prehistoric Research Monograph Series. Boston: Brill.
- Bar-Yosef, O. 1981. The Epi-palaeolithic complexes in the southern Levant. In *Préhistoire du Levant: chronologie et l'organisation de l'espace depuis les origines jusqu'au VIème millénaire*. J. Cauvin and P. Sanlaville, eds. Pp. 389–408. Lyon: Maison de L'Orient.
- . 1986. The walls of Jericho: an alternative explanation. *Current Anthropology* 27:157–162.
- , ed. 1998. *The transition to agriculture in the Old World*. Thematic issue, *Review of Archaeology* 19.
- . 2002. Natufian: a complex society of foragers. In *Beyond foraging and collecting: evolutionary change in hunter-gatherer settlement systems*. B. Fitzhugh and J. Habu, eds. Pp. 91–149. New York: Kluwer Academic/Plenum.
- Bar-Yosef, O., and D. Alon. 1988. *Nahal Hemar cave*. 'Atiqot English Series, vol. 18. Jerusalem: Department of Antiquities and Museums.
- Bar-Yosef, O., and A. Belfer-Cohen. 1989. The origins of sedentism and farming communities in the Levant. *Journal of World Prehistory* 40:447–498.
- Bar-Yosef, O., and A. Gopher, eds. 1997. *An Early Neolithic village in the Jordan Valley. I. The archaeology of Netiv Hagdud*. American School of Prehistoric Research Bulletin 43. Cambridge, MA: Peabody Museum of Archaeology and Ethnology, Harvard University.
- Bar-Yosef, O., A. N. Goring-Morris, and A. Gopher, eds. 2010. *Gilgal: excavations at Early Neolithic sites in the lower Jordan Valley: the excavations of Tamar Noy*. Oakville, CT: ASPR & David Brown/Oxbow.
- Bar-Yosef, O., and A. Khazanov, eds. 1992. *Pastoralism in the Levant*. Monographs in World Archaeology, vol. 10. Madison, WI: Prehistory.
- Bar-Yosef Mayer, D. E. 2005. The exploitation of shells as beads in the Palaeolithic and Neolithic of the Levant. *Paléorient* 31:176–185.
- Barzilai, O. 2009. Social complexity in the southern Levantine PPNB as reflected through lithic studies: the bidirectional blade industries. PhD thesis, Hebrew University of Jerusalem.
- Belfer-Cohen, A. 1988. The Natufian settlement at Hayonim cave: a hunter-gatherer band on the threshold of agriculture. PhD thesis, Hebrew University of Jerusalem.
- Belfer-Cohen, A., and E. Hovers. 2005. The groundstone assemblages of the Natufian and Neolithic societies in the Levant: a brief review. *Journal of the Israel Prehistoric Society* 35:299–308.
- Belfer-Cohen, A., and A. N. Goring-Morris. 2011. Becoming farmers: the inside story. *Current Anthropology* 52(suppl. 4):S209–S220.
- Bellwood, P. 2005. *First farmers: the origins of agricultural societies*. Malden, MA: Blackwell.
- Betts, A., ed. 1998. *The Harra and the Hamad: excavations and surveys in eastern Jordan*, vol. 1. Sheffield Archaeological Monographs 9. Sheffield: Sheffield Academic Press.
- Bienert, H. D., H.-G. K. Gebel, and R. Neef, eds. 2004. *Central settlements in Neolithic Jordan*. Berlin: Ex Oriente.
- Binford, L. R. 1968. Post-Pleistocene adaptations. In *New perspectives in archaeology*. S. Binford and L. R. Binford, eds. Pp. 313–341. Chicago: Aldine.
- . 2001. *Constructing frames of reference: an analytical method for archaeological theory building using ethnographic and environmental data sets*. Berkeley: University of California Press.
- Bocquet-Appel, J.-P. 2011. The agricultural demographic transition during and after the agriculture inventions. *Current Anthropology* 52(suppl. 4):S497–S510.
- Bocquet-Appel, J.-P., and O. Bar-Yosef, eds. 2008. *The Neolithic demographic transition and its consequences*. Dordrecht: Springer.
- Bogaard, A. 2005. "Garden agriculture" and the nature of early farming in Europe and the Near East. *World Archaeology* 37:177–196.
- Bogaard, A., and V. Isaakidou. 2010. From megasites to farmsteads: community size, ideology and the nature of early farming landscapes in Western Asia and Europe. In *Landscapes in transition: understanding hunter-gatherer and farming landscapes in the Early Holocene of Europe and the Levant*. B. Finlayson and G. Warren, eds. Pp. 192–207. Levant Supplementary Series, vol. 8. Oxford: Oxbow.
- Boserup, E. 1981. *Population and technological change: a study of long-term trends*. Chicago: University of Chicago Press.
- Byrd, B. F. 1990. Late Pleistocene assemblage diversity in the Azraq Basin. *Paléorient* 14:257–265.
- . 2005. Reassessing the emergence of village life in the Near East. *Journal of Archaeological Research* 13:231–290.
- Campana, D. V. 1991. Bone implements from Hayonim cave: some relevant issues. In *The Natufian culture in the Levant*. O. Bar-Yosef and F. R. Valla, eds. Pp. 459–466. Ann Arbor, MI: International Monographs in Prehistory.
- Campbell, D. 2010. Modelling the agricultural impacts of the earliest large villages at the Pre-Pottery Neolithic–Pottery Neolithic transition. In *Landscapes in transition: understanding hunter-gatherer and farming landscapes in the Early Holocene of Europe and the Levant*. B. Finlayson and G. Warren, eds. Pp. 173–183. Levant Supplementary Series, vol. 8. Oxford: Oxbow.
- Cauvin, J. 2000. *The birth of the gods and the origins of agriculture*. Cambridge: Cambridge University Press.
- Childe, V. G. 1934. *New light on the most ancient Near East*. New York: Kegan Paul, Trench, Trubner.
- Cope, C. 1991. Gazelle hunting strategies in the southern Levant. In *The Natufian culture in the Levant*. O. Bar-Yosef and F. R. Valla, eds. Pp. 341–358. Ann Arbor, MI: International Monographs in Prehistory.
- Crowfoot-Payne, J. 1976. The terminology of the Aceramic Neolithic period in the Levant. In *Deuxième colloque sur la terminologie de la préhistoire du Proche-Orient*. R. Wendorf, ed. Pp. 131–137. Nice: UISPP.
- Davis, S. J. M. 1983. The age profiles of gazelles predated by ancient

- man in Israel: possible evidence for a shift from seasonality to sedentism in the Natufian. *Paléorient* 9:55–62.
- . 1987. *The archaeology of bones*. London: Batsford.
- Delerue, S. 2007. L'obsidienne dans le processus de néolithisation du Proche-Orient (12000–6500 av. J.-C. cal.). PhD dissertation, Université Bordeaux 3.
- Driesch, A. von den, and U. Wodtke. 1997. The fauna of 'Ain Ghazal, a major PPN and Early PN settlement in central Jordan. In *The prehistory of Jordan, II*. H.-G. K. Gebel and G. O. Rollefson, eds. Pp. 511–556. Berlin: Ex Oriente.
- Edwards, P. C. 1991. Wadi Hammeh 27: an Early Natufian site at Pella, Jordan. In *The Natufian culture in the Levant*. O. Bar-Yosef and F. R. Valla, eds. Pp. 123–148. Ann Arbor, MI: International Monographs in Prehistory.
- Enzel, Y., R. Amit, U. Dayan, O. Crouvi, R. Kahana, B. Ziv, and D. Sharon. 2008. The climatic and physiographic controls of the eastern Mediterranean over the Late Pleistocene climates in the southern Levant and its neighboring deserts. *Global and Planetary Change* 60:165–192.
- Esin, U., and S. Harmankaya. 1999. Asikli. In *Neolithic in Turkey: the cradle of civilization: new discoveries*. M. Özdoğan and N. Başgelen, eds. Pp. 115–131. Istanbul: Arkeologie ve Sanat Yayınları.
- Finlayson, B., and S. Mithen, eds. 2007. *The early prehistory of Wadi Faynan, southern Jordan*. Oxford: Oxbow.
- Flannery, K. V. 1969. Origins and ecological effects of early domestication in Iran and the Near East. In *The domestication and exploitation of plants and animals*. P. J. Ucko and G. W. Dimbleby, eds. Pp. 23–53. London: Duckworth.
- Garfinkel, Y., M. E. Kislev, and D. Zohary. 1988. Lentil in the Pre-Pottery Neolithic B Yiftah'el: additional evidence of its early domestication. *Israel Journal of Botany* 37:49–51.
- Garrod, D. A. E., and D. M. A. Bate. 1937. *Excavations at the Wadi Mughara*, vol. 1 of *The Stone Age of Mount Carmel*. Oxford: Clarendon.
- Goring-Morris, A. N. 1989. Socio-cultural aspects of marine mollusc use in the Terminal Pleistocene of the Negev and Sinai regions of the southern Levant. In *Proceedings of the shell bead conference: selected papers*. C. F. Hayes III, L. Ceci, and C. C. Bodner, eds. Pp. 175–188. Rochester Museum and Science Center Research Records, no. 20. Rochester, NY: Rochester Museum and Science Center.
- . 1991. The Harifian of the southern Levant. In *The Natufian culture in the Levant*. O. Bar-Yosef and F. R. Valla, eds. Pp. 173–234. Ann Arbor, MI: International Monographs in Prehistory.
- . 1993. From foraging to herding in the Negev and Sinai: the Early to Late Neolithic transition. *Paléorient* 19:63–87.
- . 1995. Complex hunter-gatherers at the end of the Paleolithic (20,000–10,000 BP). In *The archaeology of society in the Holy Land*. T. E. Levy, ed. Pp. 141–168. London: Leicester University Press.
- . 2005. Life, death and the emergence of differential status in the Near Eastern Neolithic: evidence from Kfar HaHoresh, lower Galilee, Israel. In *Archaeological perspectives on the transmission and transformation of culture in the eastern Mediterranean*. J. Clark, ed. Pp. 89–105. Oxford: Oxbow.
- Goring-Morris, A. N., and A. Belfer-Cohen. 1997. The articulation of cultural processes and Late Quaternary environmental changes in Cisjordan. *Paléorient* 23:71–93.
- . 2003. Structures and dwellings in the Upper and Epipalaeolithic (ca. 42–10 K BP) Levant: profane and symbolic uses. In *Perceived landscapes and built environments*. O. Soffer, S. Vasil'ev, and J. Kozłowski, eds. Pp. 65–81. BAR International Series 1122. Oxford: Archaeopress.
- . 2010. "Great Expectations"; or, the inevitable collapse of the Early Neolithic in the Near East. In *Early village society in global perspective*. M. S. Bandy, and J. Fox, eds. Pp. 62–77. Tucson: University of Arizona Press.
- Goring-Morris, A. N., E. Hovers, and A. Belfer-Cohen. 2009. The dynamics of Pleistocene settlement patterns and human adaptations in the Levant: an overview. In *Transitions in prehistory: papers in honor of Ofer Bar-Yosef*. J. J. Shea and D. Lieberman, eds. Pp. 187–254. Oakville, CT: Brown.
- Grosman, L. 2004. Computer simulation of variables in models of the origins of agriculture in the Levant. PhD dissertation, Hebrew University of Jerusalem.
- Grosman, L., and A. Belfer-Cohen. 2002. Zooming onto the "Younger Dryas." In *The dawn of farming in the Near East*. R. T. J. Cappers and S. Bottema, eds. Pp. 49–54. Berlin: Ex Oriente.
- Guilaine, J., and A. Le Brun, eds. 2003. *Le néolithique de Chypre*. Bulletin de correspondance hellénique, supplément 43. Athens: École française d'Athènes.
- Hayden, B. 1990. Nimrods, piscators, pluckers, and planters: the emergence of food production. *Journal of Anthropological Archaeology* 9:31–69.
- Henry, D. O. 1989. *From foraging to agriculture: the Levant at the end of the Ice Age*. Philadelphia: University of Pennsylvania Press.
- Heun, M., R. Schafer-Pregl, D. Klawan, R. Castagna, M. Accerbi, B. Borghi, and F. Salamini. 1997. Site of einkorn wheat domestication identified by DNA fingerprinting. *Science* 278:1312–1314.
- Hillman, G. C. 2000. Overview: the plant-based components of subsistence in Abu Hureyra 1 and 2. In *Village on the Euphrates: from foraging to farming at Abu Hureyra*. A. M. T. Moore, G. C. Hillman, and A. J. Legge, eds. Pp. 416–422. Oxford: Oxford University Press.
- Hillman, G. C., and M. S. Davies. 1992. Domestication rates in wild wheats and barley under primitive cultivation. In *Préhistoire de l'agriculture: nouvelles approches expérimentales et ethnographiques*. P. C. Anderson-Gerfaud, ed. Pp. 113–158. Paris: CNRS.
- Hodder, I. 2007. Çatalhöyük in the context of the Middle Eastern Neolithic. *Annual Review of Anthropology* 36:105–120.
- Horwitz, L. K., T. Simmons, O. Lerna, and E. Tchernov. 2010. Fauna from the sites of Gilgal I, II and III. In *Gilgal: excavations at Early Neolithic sites in the Lower Jordan Valley: the excavations of Tamar Noy*. O. Bar-Yosef, A. N. Goring-Morris, and A. Gopher, eds. Pp. 263–296. Oakville, CT: Brown.
- Horwitz, L. K., E. Tchernov, P. Ducos, C. Becker, A. von den Driesch, L. Martin, and A. N. Garrard. 2000. Animal domestication in the southern Levant. *Paléorient* 25(2):63–80.
- Ibáñez, J. J., ed. 2008. *Le site néolithique de Tell Mureybet (Syrie du Nord): en hommage à Jacques Cauvin*. BAR International Series 1843. Oxford: Archaeopress.
- Johnson, G. A. 1982. Organizational structure and scalar stress. In *Theory and explanation in archaeology*. C. A. Renfrew, M. J. Rowlands, and B. A. Segraves, eds. Pp. 389–421. London: Academic Press.
- Kenyon, K. M. 1981. *The architecture and stratigraphy of the Tell, vol. 3 of Excavations at Jericho*. London: British School of Archaeology in Jerusalem.
- Kilian, B., H. Özkan, J. Kohl, A. von Haeseler, F. Barale, O. Deusch, A. Brandolini, C. Yucel, W. Martin, and F. Salamini. 2006. Haplotype structure at seven barley genes: relevance to gene pool bottlenecks, phylogeny of ear type and site of barley domestication. *Molecular Genetics and Genomics* 276:230–241.
- Kilian, B., H. Özkan, A. Walthers, J. Kohl, T. Dagan, F. Salamini, and W. W. Martin. 2007. Molecular diversity at 18 loci in 321 wild and 92 domesticate lines reveal no reduction of nucleotide diversity during *Triticum monococcum* (einkorn) domestication: implications for the origin of agriculture. *Molecular Biology and Evolution* 24:2657–2668.
- Kislev, M. E. 1997. Early agriculture and paleoecology of Netiv Hagdud. In *An Early Neolithic village in the Jordan Valley. I. The archaeology of Netiv Hagdud*. O. Bar-Yosef, and A. Gopher, eds. Pp. 209–236. Cambridge, MA: Peabody Museum of Archaeology and Ethnology, Harvard University.

- Kosse, K. 1994. The evolution of large, complex groups: a hypothesis. *Journal of Anthropological Archaeology* 13:35–50.
- Kuijt, I. 2000. People and space in early agricultural villages: exploring daily lives, community size, and architecture in the Late Pre-Pottery Neolithic. *Journal of Anthropological Archaeology* 19:75–102.
- Kuijt, I., and B. Finlayson. 2009. Evidence for food storage and pre-domestication granaries 11,000 years ago in the Jordan Valley. *Proceedings of the National Academy of Sciences of the USA* 106: 10966–10970.
- Le Dosseur, G. 2008. La place de l'industrie osseuse dans la neolithisation au Levant sud. *Paléorient* 34:59–89.
- Lev-Yadun, S., A. Gopher, and S. Abbo. 2000. The cradle of agriculture. *Science* 288(5741):1602–1603.
- Martin, L. A. 1994. Hunting and herding in a semi-arid region: an archaeological and ethological study of the faunal remains from the Epipalaeolithic and Neolithic of eastern Jordan. PhD thesis, University of Sheffield.
- . 2000. Gazelle (*Gazella* spp.) behavioural ecology: predicting animal behaviour for prehistoric environments in Southwest Asia. *Journal of the Zoological Society of London* 250:13–30.
- Mazurek, R., and B. Jamous. 2001. Tell Qaramel: excavations 2000. *Polish Archaeology in the Mediterranean* 12:327–341.
- McCartney, C., S. W. Manning, D. Sewell, and S. T. Stewart. 2007. The EENC 2006 field season: excavations at Agia Varvara-Asprokremmos and survey of the local Early Holocene landscape. *Report of the Department of Antiquities, Cyprus* 2007:27–44.
- Mellaart, J. 1975. *The Neolithic of the Near East*. London: Thames & Hudson.
- Muhsen, M., and H. Wada. 1995. An analysis of the microliths at Kharaneh IV, phase D, square A20/37. *Paléorient* 21:75–95.
- Munro, N. D. 2004. Zooarchaeological measures of hunting pressure and occupation intensity in the Natufian: implications for agricultural origins. *Current Anthropology* 45(suppl.):S5–S33.
- Naderi, S., H. R. Rezaei, P. Taberlet, S. Zundel, S. A. Rafat, H. R. Nagash, M. A. El-Barody, O. Ertugrul, and F. Pompanon. 2007. Large-scale mitochondrial DNA analysis of the domestic goat reveals six haplogroups with high diversity. *PLoS ONE* 10:1–23.
- Naveh, D. 2003. PPNA Jericho: a socio-political perspective. *Cambridge Archaeological Journal* 13:83–96.
- Nesbitt, M. 2002. When and where did domesticated cereals first occur in Southwest Asia? In *The dawn of farming in the Near East*. R. T. J. Cappers and S. Bottema, eds. Pp. 113–132. Berlin: Ex Oriente.
- Özdoğan, M. 1997. Anatolia from the Last Glacial Maximum to the Holocene Climatic Optimum: cultural formations and the impact of the environmental setting. *Paléorient* 23:25–38.
- . 2011. Archaeological evidence on the westward expansion of farming communities from eastern Anatolia to the Aegean and the Balkans. *Current Anthropology* 52(suppl. 4):S415–S430.
- Peasall, B. L. 2000. The Round House Horizon along the Taurus-Zagros Arc: a synthesis of recent excavations of Late Epipalaeolithic and Early Aceramic sites in southeastern Anatolia and northeastern Iraq. PhD dissertation, University of Pennsylvania, Philadelphia.
- Peltenburg, E., and A. Wasse, eds. 2004. *Neolithic revolution: new perspectives on Southwest Asia in light of recent discoveries on Cyprus*. Oxford: Oxbow.
- Perlès, C. 2005. From the Near East to Greece: let's reverse the focus: cultural elements that didn't transfer. In *How did farming reach Europe?* C. Lichter, ed. Pp. 275–290. Istanbul: Ege Yayinlari.
- Perrot, J. 1968. La préhistoire palestinienne. In *Supplément au dictionnaire de la Bible*, vol. 8. Pp. 286–446. Paris: Letougey & Ane.
- Perrot, J., and D. Ladiray. 1988. *Les hommes de Mallaha (Eynan), Israel*. Mémoires et travaux du Centre de Recherche Française de Jérusalem, no. 7. Paris: Association Paléorient.
- Redding, R. W., and M. Rosenberg. 1998. Ancestral pigs: a New (Guinea) model for pig domestication in the Middle East. *MASCA Research Papers in Science and Archaeology* 15:65–76.
- Redman, C. 1978. *The rise of civilization*. San Francisco: W. H. Freeman.
- Rindos, D. 1984. *The origins of agriculture*. Orlando, FL: Academic Press.
- Robinson, S. A., S. Black, B. W. Sellwood, and P. J. Valdes. 2006. A review of palaeoclimates and palaeoenvironments in the Levant and eastern Mediterranean from 25,000 to 5000 years BP: setting the environmental background for the evolution of human civilisation. *Quaternary Science Reviews* 25:1517–1541.
- Rollefson, G. O., and I. Köhler-Rollefson. 1989. The collapse of Early Neolithic settlements in the southern Levant. In *People and culture in change*. I. Herskovitz, ed. Pp. 73–89. BAR International Series 508. Oxford: Archaeopress.
- Ronen, A., and D. Adler. 2001. The walls of Jericho were magical. *Archaeology, Ethnology and Anthropology of Eurasia* 2:97–103.
- Rosenberg, D. 2008. Serving meals making a home: the PPNA limestone vessel industry of the southern Levant and its importance to the Neolithic revolution. *Paléorient* 34(1):23–32.
- Sapir-Hen, L., G. Bar-Oz, H. Khalaily, and T. Dayan. 2009. Gazelle exploitation in the Early Neolithic site of Motza, Israel: the last of the gazelle hunters in the southern Levant. *Journal of Archaeological Science* 36:1538–1546.
- Schick, T., E. Werker, C. Shimony, and G. Bonani. 1995. A 10,000 year old comb from Wadi Murabba'at in the Judean Desert. *Atiqot* 27:199–206.
- Schmidt, K. 2005. "Ritual centers" and the Neolithisation of Upper Mesopotamia. *Neo-Lithics* 2(5):13–21.
- . 2007. Göbekli Tepe. In *Vor 12.000 Jahren in Anatolien: die ältesten Monumente der Menschheit*. C. Lichter, ed. Pp. 74–78. Karlsruhe: Badisches Landesmuseum.
- Simmons, A. H. 2001. The first humans and last pygmy hippopotami of Cyprus. In *The earliest prehistory of Cyprus: from first colonization to exploitation*. S. Swiny, ed. Pp. 1–18. CAARI Monograph Series 2. ASOR Archaeological Reports 5. Boston: American Schools of Oriental Research.
- . 2007. *The Neolithic revolution in the Near East: transforming the human landscape*. Tucson: University of Arizona Press.
- Smith, A. 1989. The Near Eastern connection: Early to Mid-Holocene relations between North Africa and the Levant. In *Late prehistory of the Nile Basin and the Sahara*. L. Krzyzaniak and M. Kobusiewicz, eds. Pp. 69–78. Studies in African Archaeology, vol. 2. Poznan: Poznan Archaeological Museum.
- Stordeur, D. 1991. Le Natoufien et son évolution à travers les artefacts en os. In *The Natufian culture in the Levant*. O. Bar-Yosef and F. Valla, eds. Pp. 467–482. Ann Arbor, MI: International Monographs in Prehistory.
- . 2007. Les bâtiments collectifs des premiers Néolithiques de l'Euphrate: création, standardisation et mémoire des formes architecturales. *Subartu* 17:19–31.
- Stordeur, D., M. Brenet, G. Der Aprahamian, and J.-C. Roux. 2001. Les bâtiments communautaires de Jerf el-Ahmar et Mureybet Horizon PPNA (Syrie). *Paléorient* 26:29–44.
- Stutz, A. J. 2004. The Natufian in real time? radiocarbon date calibration as a tool for understanding Natufian societies and their long-term prehistoric context. In *The end of the hunter-gatherer societies in the Near East*. C. Delage, ed. Pp. 13–37. BAR International Series 1320. Oxford: Archaeopress.
- Tchernov, E. 1994. *An Early Neolithic village in the Jordan Valley. II. The fauna of Netiv Hagdud*. American Schools of Prehistoric Research Bulletin, no. 44. Cambridge: Peabody Museum of Archaeology and Ethnology, Harvard University.
- Valla, F. R. 1999. The Natufian: a coherent thought? In *Dorothy Garrod and the progress of the Palaeolithic*. W. Davies and R. Charles, eds. Pp. 224–241. Oxford: Oxbow.

- . 2008. *L'homme et l'habitat. l'invention de la maison durant la préhistoire*. Paris: CNRS.
- Verhoeven, M. 2004. Beyond boundaries: nature culture and a holistic approach to domestication in the Levant. *Journal of World Prehistory* 18:179–282.
- Vigne, J.-D. 2008. Zooarchaeological aspects of the Neolithic diet transition in the Near East and Europe, and their putative relationships with the Neolithic demographic transition. In *The Neolithic demographic transition and its consequences*. J. P. Bocquet-Appel and O. Bar-Yosef, eds. Pp. 179–205. New York: Springer.
- Vigne, J.-D., I. Carrère, F. Briois, and J. Guilaine. 2011. The early process of mammal domestication in the Near East: new evidence from the Pre-Neolithic and Pre-Pottery Neolithic in Cyprus. *Current Anthropology* 52(suppl. 4):S255–S271.
- Vigne, J.-D., and D. Helmer. 2007. Was milk a “secondary product” in the Old World Neolithisation process? its role in the domestication of cattle, sheep and goats. *Anthropozoologica* 43:9–40.
- Wasse, A. 1997. Preliminary results of an analysis of sheep and goat bones from 'Ain Ghazal, Jordan. In *The prehistory of Jordan II: perspectives from 1997*. H.-G. K. Gebel, Z. Kafafi, and G. O. Rollefson, eds. Pp. 575–592. Berlin: Ex Oriente.
- Watkins, T. 2005. The Neolithic revolution and the emergence of humanity: a cognitive approach to the first comprehensive worldview. In *Archaeological perspectives on the transmission and transformation of culture in the eastern Mediterranean*. J. Clark, ed. Pp. 84–88. Oxford: Oxbow.
- . 2008. Supra-regional networks in the Neolithic of Southwest Asia. *Journal of World Prehistory* 21:139–171.
- Weinstein-Evron, M., D. Kaufman, and N. Bird-David. 2001. Rolling stones: basalt implements as evidence for trade/exchange in the Levantine Epipalaeolithic. *Journal of the Israel Prehistoric Society—Mitekufat Ha'even* 31:25–42.
- Weiss, E., M. E. Kislev, and A. Hartmann. 2006. Autonomous cultivation before domestication. *Science* 312:1608–1610.
- Weiss, E., and D. Zohary. 2011. The Neolithic Southwest Asian founder crops: their biology and archaeobotany. *Current Anthropology* 52(suppl. 4):S237–S254.
- Wick, L., G. Lemcke, and M. Sturm. 2003. Evidence of Late Glacial and Holocene climatic change in eastern Anatolia: high-resolution pollen, charcoal, isotopic and geochemical records from the laminated sediments of Lake Van, Turkey. *Holocene* 13:665–675.
- Willcox, G. 2005. The distribution, natural habitats and availability of wild cereals in relation to their domestication in the Near East: multiple events, multiple centres. *Vegetation History and Archaeobotany* 14:534–541.
- Wobst, H. M. 1976. Locational relationships in Palaeolithic society. *Journal of Human Evolution* 5:49–58.
- Wright, K. I. 2000. The social origins of cooking and dining in early villages of western Asia. *Proceedings of the Prehistoric Society* 66: 89–121.
- Zackheim, O. 1997. Provenance of ochre from the Natufian assemblages of el-Wad, Eynan and Hayonim. MA thesis, University of Haifa.
- Zeder, M. A. 2009. The Neolithic macro-(r)evolution: macroevolutionary theory and the study of culture change. *Journal of Archaeological Research* 17:1–63.
- . 2011. The origins of agriculture in the Near East. *Current Anthropology* 52(suppl. 4):S221–S235.