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Reassessing the Emergence of Village Life in the Near East

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This article reassesses the timing, context, and impetus for the onset of sedentary, complex hunter-gatherers, food production, and village life in the Near East during the Late Pleistocene and Early Holocene. Drawing on recent paleoclimatic and archaeological results, I argue that sedentism and then village life were rapid rather than gradual events that occurred during optimal climatic conditions and took place in resource-rich settings. These two social milestones included fundamental changes in economic strategies, social interaction, and ideology. Only by understanding the interplay between preexisting social institutions and human agency within communities prior to and during these periods of major social change will we be able to understand how and why food production began.

KEY WORDS: agriculture; Natufian; Neolithic; Near East.

INTRODUCTION

The origins of food production were a pivotal development in human history. Domesticated products provided the economic foundations for the subsequent rise of civilization, and early domesticates still form the basis of agriculture today. Archaeologists are particularly interested in why humans, after such a long period of time as gatherers and hunters, settled down and then began to farm and herd animals, and why this process took place throughout the world in a relatively short period of time when measured against the full length of human history (e.g., Bar-Yosef, 1998a; Guilaine, 2000; Harris, 1998a; Price and Gebauer, 1995a; Smith, 2001a). The Near East is particularly important since it is the best documented and earliest example of the origins of food production. The region's early domesticates also provided the foundations for the rise of civilization in

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Mesopotamia, and these Near Eastern founder crops rapidly spread to neighboring regions (i.e., Europe, North Africa, and South Asia) and played an important role in social developments in these regions as well (Bar-Yosef and Meadow, 1995; Cauvin, 2000; Harris, 1996; Zohary and Hopf, 2000).

In this article I position the origins of Near Eastern food production in historical context. Attention is placed on examining the timing and character of fundamental changes in community interaction and social organization in relation to external factors such as environmental change, rather than on the particulars of the domestication process and evidence for changes in the morphology of particular plant and animal species. This approach emphasizes the social dimension of economic change and places emphasis on unraveling underlying causal factors. This review integrates recent advances in four distinct research domains and aims to refocus research and debate on internal social change, social institutions, and human agency. In contextualizing early fundamental developments in social interaction, this article examines the correlation of new high-resolution global climate data with the Near Eastern paleoenvironmental record; the calibration and rigorous evaluation of archaeological dating evidence; the social implications for new paleoethnobotanical data on the origins of plant cultivation and domestication; and recent insights into community social structure, symbolism, and ritual activities. A multistaged reconstruction is then presented that stresses three sequential steps: 1) the origins of complex hunter-gatherers, 2) the onset of plant cultivation, and 3) the subsequent emergence of village life characterized by large communities practicing intensive food production.

In the Near East, the onset of sedentary, complex hunter-gatherers and then later the widespread occurrence of large food-producing villages were fundamental milestones that dramatically changed the social landscape. I argue that both were rapid rather than gradual events, took place during optimal climatic conditions, and occurred in the most productive portions of the Near East. These two social milestones included fundamental changes in economic strategies, social interaction, and ideology. Sedentary, complex hunter-gatherers emerged at the onset of the Natufian, associated with population aggregation, resource intensification, surpluses, and major changes in group dynamics, social interaction, and ideology. This restructuring was socially motivated and provided social capital that in large part benefitted the group as a whole. Subsequently, plant cultivation then began gradually as a supplemental economic activity designed to maintain the relative dietary input of cereals and legumes that were becoming less abundant due to intensive exploitation and possibly environmental decline during the Late Epipaleolithic. Larger food-producing villages then emerged abruptly during the Early Neolithic as a socially driven, opportunistic strategy that artificially created, through cultivation, an expandable resource and surpluses. In this context, the primary unit of production was the family, and community leaders and household heads garnered greater power and prestige. Later, food-producing villages were established in more diverse settings, and domesticated herd animals were integrated into the economy.

First, I review the theoretical underpinnings of these changes in economy and social organization and briefly review the Near Eastern prehistoric context. Then the new global climate data are correlated with the Near Eastern paleoenvironmental record. Subsequently, the timing of key archaeological events is examined by calibrating the dating evidence and comparing it with paleoenvironmental changes. There are two reasons why a considerable portion of this article is devoted to examining the timing of cultural events in environmental context. First, prior discussions have often stressed the importance of negative environmental change as a kicker for social development. Second, the end of the Pleistocene was a period of dramatic environmental change. Thus the underlying causes for initial changes in community organization in the Near East can be understood only by securely placing them in a broader context. In the final section, I reassess the origins of sedentism, food production, and village life in the Near East. In doing so, the key changes and new insights into social interaction, ideology, and ritual activities are highlighted.

This article aims to reorient discourse and stimulate research into how and why fundamental changes in community interaction took place near the end of the Pleistocene in the Near East. The goal of this reassessment is not to create a new explanatory model of social development, for clearly the data are too weak at present to understand precisely why these changes happened when and how they did. Instead, the objective is to demonstrate that reliance on external factors is insufficient to explain these developments and that primacy must be placed on examining the interplay between preexisting social institutions and human agency within hunter-gatherer communities prior to and during these periods of major social change. In doing so, a hypothetical scenario is presented, consistent with current knowledge of conditions and existing data, that outlines one possible process by which social order was altered during economic shifts.

THEORETICAL CONTEXT

Smith (2001b) provides an excellent summary of the terminological difficulties inherent in examining the middle ground between food procurement and agricultural food production (see also Leach's [1997] and Terrell *et al.*'s [2003] discussion of the relationship between semantics and interpretation). I follow Smith (2001b, fig. 7) in using the term food procurement to refer to collecting wild food resources and the term food production to characterize a spectrum of adaptations ranging from low-level food production without domesticates to large-scale intensive agriculture of morphologically domesticated resources. Here I use the terms cultivation and herding to refer to the *human actions* of planting and of maintaining animal herds with no implied meaning regarding changes in the genetic makeup and morphology of these resources. Cultivation includes planting, protection, collection, storage, and reseeding and may be correlated with broader social changes (Harris, 1990). Although cultivation has been defined in many ways (e.g., Ford, 1985; Harris, 1996; Nesbitt, 2002), there is not a widely accepted term to refer solely to these human actions that does not include changes in plants as well. Finally, the terms domestic and domestication refer to plants and animals that have undergone genetic changes that have recognizable phenotypic expressions. These changes generally occurred after cultivation and herding began (yet, see Ladizinsky [1989] for a possible Near Eastern exception to this trend).

There has been a tremendous increase in research on the origins of food production during the last 15–20 years. This has resulted in a series of important publications, including monographs and edited volumes that address both data and theory (e.g., Cappers and Bottema, 2002; Damania *et al.*, 1998; Harris and Hillman, 1989; Price and Gebauer, 1995a; Smith, 1998). For the most part, these publications have yielded a large body of important data that provide insight into the what, where, and when questions posed for the origins of agriculture. There has been considerably less discussion, however, of the how and why aspects of this fundamental transition. This is not meant to imply that recent publications have been devoid of theoretical discussion (see Hayden, 1995a; Smith, 2001a; Watson, 1995). In fact, there have been several worldwide theories put forward recently to explain the origins of food production (e. g., Alvard and Kuznar, 2001; Hayden, 1990; Redding, 1988; Richerson *et al.*, 2001; Rosenberg, 1990). In general, casual factors presented in these explanations can be divided into three main categories: environmental change, population pressure, and changes in social organization. These are sometimes further reduced in synthetic reviews to the binary categories of internal and external explanatory factors, with external factors invariably getting the most attention (Price and Gebauer, 1995b).

At present, no single theory at a general level of explanation is widely accepted (e.g., Hayden, 1995a; Richerson *et al.*, 2001; Smith, 2001a), in part because competing theories for the origins of food production that are currently grouped under one big tent are often talking about very different topics, different types of resources, and events that took place in different areas of the world and that occurred at very different times in the past. As Harris (1989) points out, it also is often unclear what phenomena are being explained—the social interactions that typified early village life, cultivation, domestication, just plants, just animals or various combinations, pristine centers of domestication, or secondary and tertiary domestication areas as well? This makes direct comparisons of competing explanations difficult at best, and most confusing of all, alternative theories can both be correct, depending on what aspect of the process is being considered.

The primary reason for this problem is that research has tended to focus on the domestication process itself, particularly with respect to plants (e.g., Cappers and Bottema 2002; Cowan and Watson, 1992; Damania *et al.*, 1998; Smith, 1998, 2001b). Research on the domestication process (including studies of the cytogenetics of domestic species, their potential wild progenitors, and their probable geographic distribution) has provided crucial insights into early food production and greatly enhanced our understanding of the timing, location, and precise character of the domestication process (e.g., Harris, 1998a, 1998b, 2002; Jones and Brown, 2000; Özkan *et al.*, 2002; Salamini *et al.*, 2002; Smith, 1998; Zohary, 1996). This focus on the domestication process also has resulted in a series of explanations that draw heavily on neo-Darwinian evolutionary theory, place explanatory primacy on environmental variables, and at times have an environmentally deterministic tone (e.g., Diamond, 1999; Richerson *et al.*, 2001; Rindos, 1984).

This emphasis on the domestication aspect of the origins of food production is to be expected, since as Smith (2001b, p. 14) notes "... it is a clear and constant vantage point and point of reference." It is also an important topic in its own right. As a result, however, less attention has been placed on understanding the changes that were taking place within the human societies themselves (yet see Bender, 1978; Cauvin, 2000; Hayden, 1990, 1995b, 2001; Hodder, 1990; Hodder and Cessford, 2004). To understand how and why cultivation and food production emerged, as much, if not more, attention needs to be focused on the social dimensions of this change in economy. This is necessary because the genetic and morphological evidence of domestication are largely epiphenomena of cultivation and herding and have little relationship to the casual factors that led to these alterations in human activity. An emphasis on social behavior prior to evidence of domestication logically brings the study of initial cultivation—the first major step by hunter-gatherers into food production—under the umbrella of research that examines resource intensification.

Although resource intensification is currently viewed in various ways, Broughton (1997, p. 846) defines it as "a process by which the total productivity or yield per areal unit of land is increased at the expense of declines in overall caloric return rates or *foraging efficiency* .. . . " Thus resource intensification is the result of consuming increasing quantities of lower-ranked, less productive plant and animal species. These are typically smaller and more numerous resources, and this requires more labor, time and planning depth, more gear and equipment for collection and processing, and more reliance on storage. Understanding the social dynamics and organizational structure that shaped this decision-making process are key. Cultivation is a form of resource intensification since it entails increasing labor input to improve total productivity.

This acknowledgment draws us explicitly into theoretical discussions on the correlation between hunter-gatherer resource intensification and the emergence of social complexity (e.g., Hayden, 1981, 1995b, 1996, 2001; Ingold, 1983; Matson, 1985). Most scholars agree that hunter-gatherer resource intensification is associated with what Woodburn (1980) has termed delayed-return societies as opposed to immediate-return societies (also termed collectors and foragers, respectively [Binford, 1980]). Several issues are central to understanding emergent social complexity among hunter-gatherers from a cross-cultural perspective. Notably, these include the extent of group versus individual rights and the nature and magnitude of sharing within these small-scale societies. As noted by Barnard and Woodburn (1988), among others, there are two important aspects of this topic. First, what is the nature of property rights and how are they transmitted between generations? This is particularly important as property rights serve as vehicles for expressing ideas and values and for maintaining and reproducing the social order. Second, what is the character and extent of property ownership within a society?

The fundamental question is how and under what conditions will hunter-gatherers change from being immediate-return foragers to being intensified collectors with delayed return and ultimately having an increasingly nonegalitarian social structure? Certainty this was not a simple unilinear process. Notably, changes in ideology within ritual contexts can provide the opportunity to create binding relationships between individuals, both kin and affines, who are directly related to the control and allocation of resources (Arnold, 1996; Barnard and Woodburn, 1988; Hayden, 1996; Ingold *et al.*, 1988). More rigorous examination of changes in social complexity and ideology has the potential to greatly enhance understanding of how and why food production began (Woodburn, 1982). This approach, which aims to unravel changes in social order and institutions, is greatly enhanced by examining what Wiessner (2002, p. 234) has termed the "recursive interaction between structure and agency."

One persistent debate in theoretical discussions about the origins of social complexity and food production has been whether social change occurred in stressful or nonstressful conditions (Arnold, 1996; Barnard and Woodburn, 1988; Hayden, 1996; Price and Gebauer, 1995a)? Did these events occur in contexts of resource abundance or resource shortage? There also is a trend to see external factors as stressful and internal factors as nonstressful (Hayden, 1990, 1995b). There is, of course, no shortage of alternative opinions, many of which view environmental stress as a potential kicker event for emergent complexity.

In summary, two points are emphasized. First, initial sedentism and the origins of cultivation need to be separated from the domestication process, as this allows us to turn our attention to the social systems of complex hunter-gatherers. Second, both internal and external factors must be considered in order to fully understand the dynamics of social change. Thus the following discussion focuses on the time period from just prior to initial sedentism through early cultivation, examining both the natural setting and prehistoric cultural complexes. First, however, the overall prehistoric context for this topic in the Near East is reviewed.

THE PREHISTORIC CONTEXT OF THE NEAR EAST

The Near East is currently the earliest and best-documented area in the world where the fundamental transition from food procurement to food production took place. A variety of regional explanatory models for the origins of sedentism and food production in the Near East have been put forward in recent years. Causal factors presented in these arguments have included environmental stress, population expansion and contraction in concert with environmental changes, and internal social changes (e.g., Bar-Yosef, 1998b, 2001a; Belfer-Cohen and Bar-Yosef, 2000; Cauvin, 2000; Goring-Morris and Belfer-Cohen, 1997; Henry, 1989, 2002; Hodder, 1990; McCorriston and Hole, 1991; Moore and Hillman, 1992). As noted by a number of scholars (Baruch and Bottema, 1999; Grossman and Belfer-Cohen, 2002; Henry, 2002), the perspective that negative environmental change drove Near Eastern culture change has been the most widely advocated explanation.

Archaeological field research on this topic in the Near East has focused on cultural events dating to the Late Pleistocene and Early Holocene (Table I). The intensity of this research is inversely correlated with the age of the cultural period (i.e., decreasing as age increases) and has been very geographically uneven. The most extensive research during the last 20 years has taken place in the southern Levant (modern-day Israel, Jordan, and the West Bank), followed by the northern Levant (primarily in Syria as opposed to Lebanon). Much less field research has taken place along the Taurus-Zagros flanks in southeastern Turkey and northwestern Iraq, but several projects in this area in recent years have produced exciting new results, the implications of which are only beginning to be fully recognized (e.g., Kozlowski, 1999; Özdoğan and Basgelen, 1999). The eastern portion of the Fertile Crescent (Iran and the rest of Iraq) has seen little or no recent fieldwork and remains poorly understood (Hole, 1998).

This paper focuses on the best-documented regions—the Levant and the Taurus-Zagros flanks of southeastern Turkey and northwestern Iraq—and does not examine contemporaneous trends in central Anatolia or Iran and the rest of Iraq. It should be stressed that there was never a single pan-Near Eastern culture, and throughout the Late Pleistocene and Early Holocene a variety of regionally restricted cultural complexes existed that interacted with each other in assorted manners. Moreover, the pace and nature of changes in social organization and economic strategies were highly varied throughout the Near East, often differing greatly between the southern Levant, northern Levant, and the Taurus-Zagros flanks, as well as being distinct from other adjacent regions. Moreover, socioeconomic adaptations were often very different at a single point in time within each of these regions (for example, between the forested and desert portions of southern Levant during the Late Pleistocene). Thus the emergence of Near Eastern agricultural villages was not a uniform pan-Near Eastern phenomenon in timing

Table I. Summary of Relevant Near Eastern Culture Historical Sequence[a]

Cultural period	Calibrated years before present (uncalibrated age estimates)	Phase	Subphases	Notable developments
Early Epipaleolithic	23,000 – 18,000 B.P. (19,400 – 15,000 b.p.)	Kebaran and Qalkan most widely recognized in Levant	na	First evidence of cereal exploitation
Middle Epipalieothic	18,000 – 14,900/14,600 B.P. (15,000 – 12,500 b.p.)	Geometric Kebaran, Mushabian most widely recognized in Levant	na	Varied hunting and gathering strategies
Late Epipaleolithic	14,900/14,600 – 12,000/11,700 B.P. (12,500 – 10,250 / 10,100 b.p.)	Natufian (in the southern Levant)	Early, Late (Harifian in Negev)	Sedentary hunting and gathering emerges
Early Neolithic	12,000/11,700 – 10,650 B.P. (10,250 / 10,100 – 9400 b.p.)	Pre-Pottery Neolithic A (PPNA)	Khiamian, Sultanian (Aswadian & Mureybetian)	Village food producers
	10,650 – 8400 B.P. (9400 – 7600 b.p.)	Pre-Pottery Neolithic B (PPNB)	Early, Middle, Late	Larger villages with herd animals

[a] See also Henry (1995, pp. 33–41), Kuijt and Goring-Morris (2002, pp. 366–367), and Moore (1985).

and socioeconomic details. This article highlights key developments in this process, focuses on local areas where archaeological research has provided data of sufficient resolution, and, as a result, does not address the full extent of cultural variation in time and space.

A number of temporal and cultural classifications and terms have been used to refer to Late Pleistocene and Early Holocene archaeology in the Near East (e.g., Henry, 1995, pp. 33–41; Kuijt and Goring-Morris, 2002, pp. 366–367; Moore, 1985). Table I provides both calibrated and uncalibrated age estimates for the relevant cultural periods; dates discussed in this article are calibrated calender ages (cal. B.P.) unless otherwise indicated (Stuiver *et al*., 1998). The relevant cultural events began during the Early and Middle Epipaleolithic, time periods characterized by hunters and gatherers with varied adaptive strategies (Byrd, 1998; Goring-Morris and Belfer-Cohen, 1997; Henry, 1997). Sedentary hunter-gatherers are currently first documented during the subsequent Late Epipaleolithic. In the southern Levant, the Late Epipaleolithic is primarily represented by the Natufian culture (Bar-Yosef, 1998c; Bar-Yosef and Valla, 1991; Byrd, 1989a). The Natufian is typically subdivided into Early and Late phases (and sometimes three phases [Valla, 1995, pp. 178–182]), and includes a regional variant in the Negev termed the Harifian that is contemporaneous with the latter part of the Late Natufian (Bar-Yosef, 1998c; Goring-Morris, 1991). In the Taurus-Zagros flanks and in the northern Levant, non-Natufian sedentary hunter-gatherers are contemporaneous with the latter part of the Natufian (Biçakçi, 1998; Moore *et al.,* 2000; Rosenberg and Redding, 2000).

The subsequent Early Neolithic period begins near the onset of the Holocene and includes two major phases: the Pre-Pottery Neolithic A (PPNA) and the Pre-Pottery Neolithic B (PPNB). The PPNA period is characterized by early village life and widespread indications of plant cultivation (Bar-Yosef, 1991; Cauvin, 2000; Cauvin *et al*., 1997; Kuijt and Goring-Morris, 2002). The PPNA in the Levant is frequently divided into the earlier Khiamian subphase and the later Sultanian subphase (Bar-Yosef, 2001a; Bar-Yosef and Belfer-Cohen, 1989; Cauvin, 2000, pp. 22–33), although the efficacy and diagnostic attributes of each phase have recently been called into question (e.g., Kuijt, 2001a; Mithen *et al*., 2000). However, no substantial architectural remains have been recovered from occupation horizons assigned to the Khiamian, whereas the Sultanian (also referred to occasionally as the Aswadian and Mureybetian in the central and northern Levant) and contemporaneous occupation along the Taurus-Zagors flanks is defined in part by its extensive architectural remains (e.g., Bar-Yosef and Meadow, 1995; Cauvin, 2000). The PPNA is followed 900 years later by the PPNB with its characteristic larger communities and animal herding (Bar-Yosef and Belfer-Cohen, 1989; Bar-Yosef and Meadow, 1995; Rollefson, 1989). That change, however, was not uniform across the Near East. During each phase adaptive strategies varied considerably throughout the region, and some populations, particularly but not exclusively on the margins, continued to have social and economic systems more similar to prior periods (Bar-Yosef, 2001a; Byrd, 1992; Harris, 2002; Hole, 1998). Notably, the initial sedentary hunter-gatherer camps of the Late Epipaleolithic and subsequent agricultural villages of the Early Neolithic were limited both numerically and areally.

Initial Near Eastern food production entailed at least 16 species including 11 plants (barley, bitter vetch, broad bean, chick pea, einkorn wheat, emmer wheat, flax, pea, and rye) and 5 animals (dogs, cattle, goats, pigs, and sheep) (Butler, 1998; Garrard, 1999; Harlan, 1995; Horwitz *et al.*, 1999; Peters *et al.*, 1999; Tchernov and Valla, 1997; Wilcox, 1998; Zeder, 1999; Zohary and Hopf, 2000). The initial plants cultivated for food were all annuals, as opposed to perennials, and include four grasses and five legumes, along with flax for fiber and oil. All the early Near Eastern animal domesticates, except dog, were herd animals brought under human control for their food. Moreover, all but flax are restricted to the Mediterranean woodland or edge of the adjacent steppe or grassland today (Garrard, 1999; Zohary and Hopf, 2000). Thus attention is focused on these portions of the Near East.

The temporal sequence of domestication began during the Early Natufian with the dog; domesticated grasses appeared considerably later (starting at the earliest in Late Natufian and/or PPNA), and subsequently legumes and herd animals were domesticated during the PPNB (Bar-Yosef, 1998b, 1998d; Bar-Yosef and Meadow, 1995; Garrard, 1999; Harris, 1998b; Hillman *et al.*, 2001; Tchernov and Valla, 1997; Wilcox, 2002). This was a protracted process of genetic change that took more than 5000 years. Moreover, as new archaeological data are obtained, the timing of domestication for particular species is periodically reevaluated and revised (Bar-Yosef, 1998b; Peters *et al.*, 1999; Wilcox, 1999, 2002). Indeed, perspectives on the initial timing of cereal domestication range from the Late Epipaleolithic contemporary with the Late Natufian of the southern Levant (Hillman *et al.*, 2001; Moore *et al.*, 2000) to the PPNB (Harris, 2002; Nesbitt, 2002).

The Near Eastern domestication evidence does not cluster temporally nor is it tightly correlated with the start of the region's well-defined cultural phases. So how does one explain the timing of domestication for these 16 species? One single explanation or 16 explanations, each with potentially different causal factors? Moreover, some species may potentially have been independently domesticated in more than one location (Horwitz *et al.*, 1999; Peters *et al.*, 1999; Wilcox, 2002; Zohary, 1996). Focusing on the timing of domestication places undue emphasis on epiphenomenal genetic changes at the expense of understanding what was taking place within the human societies. After all, the genetic changes were being caused, consciously or unconsciously, by humans. Indeed, paleoethnobotanical and faunal experts in the Near East have long recognized that cultivation and herding of each of these 16 species was taking place for varied lengths of time prior to clear evidence of morphologically domesticated species, and they have been concentrating on developing sophisticated approaches to discern the early steps in this process (e.g., Bar-Yosef and Meadow, 1995; Colledge, 1998, 2002; Harris, 1998b; Özkan *et al.*, 2002; Zohary *et al.*, 1998). Moreover, perspectives have varied on whether plant cultivation and herding would quickly lead to domestication (McCorriston and Hole, 1991; Zohary, 1996) or whether domestication was a slow process because of low selective pressures, perhaps taking up to 1000 years (Harris, 2002; Wilcox, 1999, 2002).

Therefore, more attention must be focused explicitly on the social aspect of initial food production. To do so, social developments prior to these genetic changes in plants and animals need to be explored in detail, and attention must be placed on the early portion of the sequence of change, particularly from the Middle Epipaleolithic through the PPNA. Rapid change occurred at the start of both the Natufian and PPNA, and the resulting social and ideological patterns were profoundly different than what had existed previously. Thus understanding the causal factors underlying the onset of these two social milestones are key to grasping the developmental process termed "the origins of food production" that culminated during the PPNB. This must be done by looking at the development of social systems within their historical and ecological context.

CURRENT LATE PLEISTOCENE/EARLY HOLOCENE CLIMATIC DATA

New high-resolution proxy climate data from annually layered ice cores, particularly in Greenland and Antarctica, is revolutionizing our understanding of how changes in the climate affected the globe during the late Pleistocene and early Holocene (Alley, 2000; Alley *et al.*, 2003; Charles, 1998). A tight chronology of events and spectacular resolution at less than the decade level is now available for the magnitude and timing of climatic events (Severinghaus and Brook, 1999; Severinghaus *et al.*, 1998; Taylor *et al.*, 1997). These developments in global paleoclimate reconstruction provide an opportunity to further link varied lines of Near Eastern paleoenvironmental evidence (including lake cores, site pollen, geoarchaeology, and archaeological information), reconcile contradictory aspects of earlier reconstructions, and more accurately assess the role of climate change in prehistoric social developments (e.g., Bar-Yosef, 1996; Bar-Yosef and Kra, 1994; Goldberg, 1986; Grossman and Belfer-Cohen, 2002; Sanlaville, 1996, 1997; Tchernov, 1997; van Zeist and Bottema, 1991; Wright, 1993). It is very difficult, however, to correlate lake core pollen diagrams across the Near East because of a variety of factors including the number of radiocarbon dates per core, the accuracy of radiocarbon assays, and varied perspectives on whether change should be regionally uniform (Baruch and Bottema, 1999; Blumler, 2002; Bottema, 2002; Cappers *et al.*, 1998, 2002; Rossignol-Strick, 1995; Yasuda *et al.*, 1999).

Climatic changes were both rapid and extreme during the Late Pleistocene and Early Holocene (Severinghaus and Brook, 1999; Severinghaus *et al.*, 1998), and some salient aspects of these dramatic changes in temperature, rainfall, and vegetation are summarized for the Near East. At the height of the last glacial maximum, 22,000 cal. B.P., the Near East was much colder and drier than today (at least 5–7°C), and the Mediterranean Sea was considerably lower (Bar-Matthews *et al*., 1997, 1999; Baruch, 1994; Galili *et al*., 2002; Sanlaville, 1997; Tchernov, 1997; van Alden and Lianos, 1983) (Fig. 1). Moreover, the Mediterranean forest, woodland, and forest-steppe (Zohary, 1973), with its stands of oaks, almonds, and pistachios and, most important, annual grasses and legumes, was primarily relegated to refugia near the Mediterranean and Black Seas (van Zeist and Bottema, 1991, pp. 121–122). The remainder of the Near East was dominated by cool, dry steppe or desert-steppe comprising mainly perennial shrubs and shrublets, with possibly more limited woodland refugia in the Zagros Mountains (Bottema, 2002; van Zeist and Bottema, 1991, fig. 42). This was an *Aretmeisa*-chenopodiaceae-dominated steppe, with numerous perennial grasses, legumes, and tubers; edible foods were diverse but in low density (Hillman, 1996, pp. 176–181). This glacial maximum pattern of vegetation ended with subsequent climatic changes, notably higher temperatures and increased rainfall (Bar-Matthews *et al*., 1997, 1999; Baruch and Bottema, 1991, 1999; Cappers *et al*., 1998; van Ziest and Bottema, 1991); Hillman's (1996) model for the spread of the Mediterranean woodland and forest-steppe north and east from the Levantine refugia throughout the Fertile Crescent has been widely endorsed by archaeologists in the region (e.g., Bar-Yosef, 1998d, 2000a; Hole, 1998; Moore, 1998; Wilcox, 1999). Finally, Near Eastern vegetation associations were very different during the Late Pleistocene and Early Holocene than today, and an ecological perspective of a chaotic environment and vegetation dynamics is best suited to envisioning vegetation changes during this era rather than environmental equilibria and vegetation successions (Blumler, 1996, 2002; Bottema, 2002; Hillman, 1996).

During this period of climatic change and fluctuations, there were two remarkable climatic events where temperature increased rapidly and dramatically around the time of the Natufian and PPNA. The first event occurred around 14,600 ± 300 cal. B.P., marking the start of the Bølling climatic regime (Severinghaus *et al*., 1998); the second took place 11,570 ± 10 cal. B.P. at the onset of the Preboreal era (Severinghaus and Brook, 1999). During both events, mean annual temperature increased globally; in Greenland where the most detailed information has been obtained, it increased 9 ± 3°C (16 ± 5°F). Each of these climate events occurred within one or two decades, in other words, in less than one generation (Severinghaus *et al*., 1998; Severinghaus and Brook, 1999). This raises the question: What social impact would these changes have had, occurring within single lifetimes?

Environmental reconstructions indicate that these two abrupt climate events were associated with increased temperature and rainfall in the Near East (Bar-Matthews *et al*., 1997, 1999; Baruch, 1994; Baruch and Bottema, 1999; Sanlaville, 1997; van Zeist and Bottema, 1991). These rapid shifts to warmer and wetter

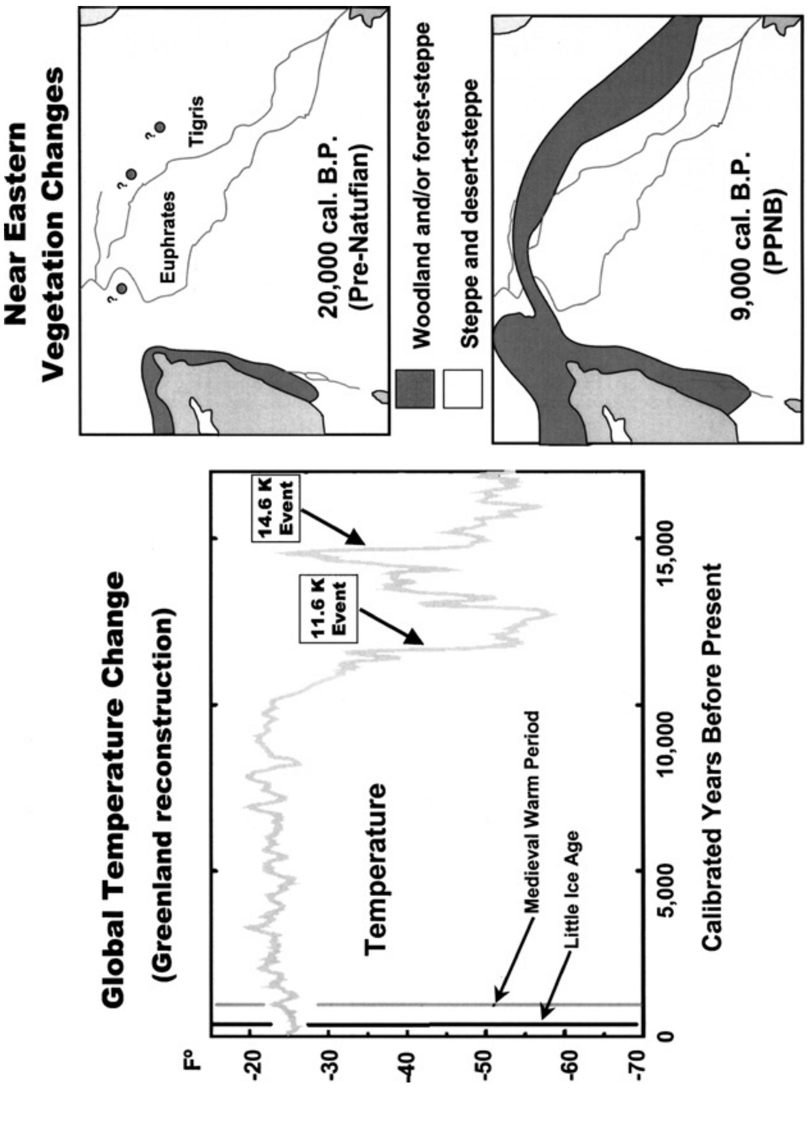

Fig. 1. Global rapid climate change events and associated changes in plant communities in the Near East (Sources: Cuffey and Clow, 1997; Hillman 1996; van Zeist and Bottema, 1991).

times had four important consequences. First, the food-rich Mediterranean woodland and forest-steppe began to spread out of its refugia, particularly in the Levant (Baruch and Bottema, 1999; Cappers *et al.*, 1998, 2002; Hillman, 1996; van Zeist and Bottema, 1991). The woodland spread quickly, at least a distance of 150–200 m per year (certain plants such as terebinths and probably cereals spread even faster), and ultimately expanded across extensive portions of the Near East (Hillman, 1996, pp. 181–189; Peteet, 2000). A second result of these dramatic climate changes was increased seasonality with more winter rain and greater summer aridity (Blumler, 2002; Byrne, 1987; McCorriston and Hole, 1991). Indeed, the Late Pleistocene and Early Holocene was a period of much more extreme seasonality than today. This extreme seasonality coupled with a rise in atmospheric CO_2 from the warming events allowed annual cereals and legumes to flourish and out compete perennials throughout a wide geographic range (Blumler, 1996; Hillman, 1996; McCorriston and Hole, 1991; Sage, 1995). Third, these climatic changes presented novel opportunities for human populations as rich, easily exploitable resources became more abundant and widespread with the expansion of the Mediterranean forest and wet steppe. Finally, these trends were slowed and partly reversed during a cooler and drier interval between 12,900 and 11,600 cal. B.P. termed the Younger Dryas. Although a great deal of emphasis has been placed on the deleterious effects of the Younger Dryas for Near Eastern hunter-gatherers (e.g., Bar Yosef, 1996; Hillman *et al.*, 2001; McCorriston and Hole, 1991; Moore and Hillman, 1992), this perspective has recently been questioned by several scholars (Baruch and Bottema, 1999; Bottema, 2002; Grossman and Belfer-Cohen, 2002). The transition to the Younger Dryas took place over a 100-year period, considerably slower than the Bølling and Preboreal rapid warming events (Severinghaus and Brook, 1999; Severinghaus *et al.*, 1998; Taylor *et al.*, 1997).

TEMPORALLY CORRELATING CLIMATIC CHANGE EVENTS WITH CULTURAL EVENTS

How did these two dramatic climatic events at the start of the Bølling and Preboreal climatic regimes correlate with actual past cultural events? First, these climatic events are more accurately dated since they are derived from annual events within continuous ice cores that have been rigorously crossdated (Severinghaus *et al.*, 1998; Severinghaus and Brook, 1999). Archaeological data, in contrast, are inherently less accurate, largely because of the material being dated, context, association, and the difficulty of dating the precise start of site occupation.

Available radiocarbon dates for The Late Epipaleolithic and PPNA were reassessed. Many Near Eastern archaeological sites during this time period have only a few dates, making the full span of site occupation uncertain. Moreover, most dates are on wood charcoal that may have been, on occasion, from trees that were living prior to when the site was occupied. The less frequent dating of seeds and nuts has provided more accurate dating results, but these small remains are also more likely to be have been postdepositionally displaced. Aberrant radiocarbon dates far outside the expected time range of the Late Epipaleolithic and PPNA and dates considered inaccurate because of early measuring techniques (solid carbon and early gas counting) were excluded due to their probable inaccuracy (van der Plicht and Bruins, 2001; Waterbolk, 1987, 1994). Comprehensive lists that include these dates are available in Byrd (1994a), Kozolowski (1994), Kuijt and Bar-Yosef (1994), and Moore *et al.* (2000).

Tables II and III list all remaining radiocarbon dates for the Late Epipaleolithic and PPNA. Dates with high statistical error (defined by excessive standard deviations) were then excluded because of their probable inaccuracy. In doing so, I follow Waterbolk (1994, p. 368) in defining low-precision dates as uncalibrated assays between 15,000 and 10,000 B.P. with standard deviations greater than 220 years, and uncalibrated assays between 10,000 and 5000 B.P. with standard deviations greater than 150 years.

Dates with low statistical error were then calibrated in order to correlate archaeological events and climatic events. This entailed using Calib ver. 4.2, which is based on the INTCAL98 version of the calibration curve (Stuiver *et al.*, 1998). This comprehensive approach using individual samples was necessary because it provided the chronological accuracy needed to make this sort of comparative study (see also Aurenche *et al.*, 2001; Bar-Yosef, 2000b; Weinstein-Evron, 1998, pp. 72–78). The calibrated calender ages of Late Epipaleolithic and PPNA events are 2200–1200 years earlier than uncalibrated radiocarbon ages.

Figure 2 presents 81 calibrated radiocarbon dates from 22 Late Epipaleolithic sites (see also Table II). These include Natufian sites in the southern Levant, Harifian sites in the Negev portion of the southern Levant, and three non-Natufian Late Epipaleolithic sites in the northern Levant and the Taurus-Zagros flanks. At present, the early part of the sequence is restricted to Early Natufian sites in the southern Levant. The onset of the Natufian is reasonably well correlated with the start of the Bølling era and subsequent warmer and wetter conditions. Only one date on unspecified wood charcoal from interior Chamber III at El Wad precedes this rapid climatic event at one standard deviation, and no calibrated dates precede this climatic event at two standard deviations. Four radiocarbon dates (three from Wadi Judayid 2 and one from Beidha) often referenced in support of a very early start for the Natufian (e.g., Henry, 1999) were excluded because of excessive sigmas (see Table II). If calibrated, however, these four dates also straddle the start of the Bølling climatic regime at one sigma. Without new dates from El Wad, preferably from seeds rather than charcoal, or from other Early Natufian sites that are considerably earlier in age, the logical conclusion is that the Natufian began just after this rapid climatic event during the Bølling climatic era 14,600 $\pm$ 300 cal. B.P. More important, for the first 1700-some years, Late Epipaleolithic hunter-gatherers enjoyed significantly warmer and wetter conditions than before.

Table II. Radiocarbon Dates for the Late Epipleolithic Including the Natufian and Contemporary Entities in Adjacent Areas[a]

Site	Reference	Uncalibrated radiocarbon dates (before present) considered accurate	Calibrated age range for radiocarbon dates considered accurate[c]	Uncalibrated radiocarbon dates (before present) considered inaccurate due to excessive sigma (>220)[b]
Southern Levant (Natufian)				
Ain Mallaha	Weinstein (1984)			11,740 ± 570, 11,590 ± 540, 11,310 ± 880
Beidha	Byrd (1989b)	12,450 ± 170, 12,130 ± 190	15,417 – 14,159, 15,176 – 13,841	12,910 ± 250
El Wad Cave & Terrace	Bar Yosef (1981), Weinstein-Evron (1998)	12950 ± 200, 12,620 ± 110, 10,740 ± 200, 10,680 ± 190	15,894 – 15,085, 15,506 – 14,354, 12,983 – 12,427, 12,950 – 12,369	11,920 ± 660, 11,475 ± 650, 9795 ± 600
Hatoula	Bar-Yosef and Gopher (1997, p. 254)	11,020 ± 180	13,162 – 12,885	
Hayonim Cave & Terrace	Bar-Yosef (1981), Housley (1994)	12,360 ± 160, 12,010 ± 180, 11,920 ± 90, 11,820 ± 120, 11,790 ± 120, 11,720 ± 120, 11,460 ± 110, 11,220 ± 110, 10,100 ± 160, 10,000 ± 100	15,352 – 14,125, 14,266 – 13,820, 14,079 – 13,816, 14,047 – 13,547, 14,030 – 13,516, 13,846 – 13,478, 13,780 – 13,182, 13,367 – 13,024, 12,102 – 11,259, 11,688 – 11,233	
Iraq ed-Dubb	Kuijt and Bar-Yosef (1994)	11,145 ± 120	13,182 – 12,998	10,785 ± 285
Jericho	Burleigh (1981)	11,166 ± 107, 11,090 ± 90	13,185 – 13,008, 13,162 – 12,987	
Kebara Cave	Bar-Yosef (1981), Housley (1994)	12,470 ± 180	15,433 – 14,168	11,150 ± 400
Nahal Oren	Weinstein (1984)			10,046 ± 318
Rakefet Cave	Goring-Morris (1987)	10,580 ± 140	12,883 – 12,342	10,980 ± 260
Rosh Horesha	Marks and Larson (1977)			10,880 ± 280, 10,490 ± 430
Saflulim	Housley (1994)	11,150 ± 100, 10,930 ± 130	13,179 – 13,005, 13,129 – 12,871	

Table II. Continued

Salibiya I	Goring-Morris (1987)			11,530 ± 550
Wadi Hammeh 27	Edwards (1991)	12,00 ± 160, 11,950 ± 160, 11,920 ± 160	15,459 – 14,518, 14,096 – 13,662, 14,110 – 13,812	
Wadi Judayid 2	Henry (1995)			12,780 ± 660, 12,750 ± 1000, 12,090 ± 800
Southern Levant (Harifian)				
Abu Salem	Goring-Morris (1987)	10,550 ± 90, 10,420 ± 100, 10,340 ± 90, 10,300 ± 100, 10,230 ± 150, 10,230 ± 150, 10,140 ± 80, 9970 ± 150	12,844 – 12,345, 12,786 – 11,973, 12,598 – 11,784, 12,564 – 11,767, 12,339 – 11,575, 12,339 – 11,575, 12,088 – 11,441, 11,693 – 11,201	
Ramat Harif	Goring-Morris (1987)	10,500 ± 100, 10,390 ± 100, 10,380 ± 100, 10,300 ± 100, 10,250 ± 100, 10,100 ± 100	12,821 – 12,185, 12,636 – 11,957, 12,630 – 11,953, 12,564 – 11,767, 12,329 – 11,700, 11,946 – 11,340	
Maaleh Ramon East	Goring-Morris (1987)	10,530 ± 100, 10,430 ± 80	12,835 – 12,335, 12,784 – 12,115	
Maaleh Ramon West	Goring-Morris (1987)			10,000 ± 200
Northern Levant and Taurus-Zagros flanks				
Abu Hureyra	Moore et al. (2000)	11,140 ± 140, 11,140 ± 100, 11,090 ± 150, 11,070 ± 160, 11,020 ± 150, 10,930 ± 150, 10,930 ± 120, 10,920 ± 140, 10,900 ± 200, 10,820 ± 160, 10,800 ± 160, 10,792 ± 82, 10,750 ± 170, 10,680 ± 150, 10,620 ± 150, 10,610 ± 100, 10,600 ± 200, 10,600 ± 200, 10,490 ± 150, 10,450 ± 180, 10,420 ± 150, 10,250 ± 160,	13,184 – 13,005, 13,177 – 13,001, 13,173 – 12,915, 13,170 – 12,903, 13,156 – 12,891, 13,138 – 12,662, 13,134 – 12,683, 13,128 – 12,681, 13,126 – 12,874, 12,999 – 12,651, 12,992 – 12,647, 12,976 – 12,635, 12,964 – 12,655, 12,932 – 12,413, 12,911 – 12,329, 12,911 – 12,329, 12,903 – 12,355, 12,832 – 12,122, 12,824 – 11,954, 12,804 – 12,374, 12,803 – 11,953,	11,450 ± 300, 9860 ± 220, 9600 ± 200

Table II. Continued

		10,050 ± 180, 10,000 ± 170	12,613 – 11,697, 11,922 – 11,202, 11901 – 11,201	
Hallan Çemi	Rosenberg (1994)	10,800 ± 220, 10,590 ± 170, 10,500 ± 170, 10,060 ± 120, 10,050 ± 80, 10,040 ± 160, 9840 ± 50, 9730 ± 90	13,012 – 12,637, 12,897 – 12,336, 12,849 – 12,114, 11,941 – 11,230, 11,933 – 11,259, 11,905 – 11,262, 11,550 – 10,601, 11,233 – 11,195	11,700 ± 460, 10,590 ± 260
Mureybet, Phase 1A	M. Cauvin (1987)	10,350 ± 150, 10,230 ± 170, 10,230 ± 170, 10,090 ± 170, 10,170 ± 200, 10,030 ± 150	12,634 – 11,767, 12,558 – 11,442, 12,558 – 11,442, 12,332 – 11,263, 12,101 – 11,257, 11,930 – 11,230	

[a] Abberant dates way outside the expected Late Epipaleolithic time range and dates considered inaccurate due to early measuring techniques (van der Plicht and Bruins, 2001; Waterbolk, 1987, 1994) are not listed.
[b] Waterbolk (1994, p. 368).
[c] These ages represent the top and bottom age values for one sigma calibration results. These results are presented in Figure 2.

Table III. Radiocarbon Dates for the PPNA[a]

Site	Reference	Uncalibrated radiocarbon dates (before present) considered accurate	Calibrated age range for radiocarbon dates considered accurate[c]	Uncalibrated radiocarbon dates (before present) considered inaccurate due to excessive sigma (>150)[b]
Abu Madi I	Bar-Yosef (1981)	10,110 ± 100, 9970 ± 120, 9920 ± 80, 9870 ± 100, 9800 ± 80, 9790 ± 100, 9790 ± 100	11,946 – 11,340, 11,685 – 11,226, 11,546 – 11,204, 11,336 – 11,185, 11,231 – 11,168, 11,233 – 11,162, 11,233 – 11,162	
Dhra	Kuijt (2001)	10,059 ± 73, 10,031 ± 69, 10,000 ± 68, 9960 ± 110, 9984 ± 67	11,908 – 11,302, 11,688 – 11,261, 11,630 – 11,258, 11,630 – 11,225, 11,554 – 11,256	9940 ± 180, 9610 ± 170
Gesher	Garfinkle and Nadel (1989)	10,020 ± 100, 9870 ± 80, 9820 ± 140, 9790 ± 140	11,885 – 11,256, 11,335 – 11,159, 11,332 – 11,196, 11,294 – 11,116	
Gigal I	Noy (1989)	9950 ± 150, 9920 ± 70, 9830 ± 80, 9710 ± 70	11,688 – 11,197, 11,554 – 11,225, 11,256 – 11,175, 11,195 – 11,093	9900 ± 220
Göbeki Tepe	Kromer and Schmidt (1998)	9559 ± 53, 9452 ± 73	11,088 – 10,699, 11,039 – 10,578	
Hatoula (Khiamian)	Bar-Yosef and Gopher (1997)	10,170 ± 120	12,285 – 11,439	
Hatoula (Sultanian)	Bar-Yosef and Gopher (1997)	10,030 ± 140	11,925 – 11,232	
Iraq ed-Dubb	Kuijt and Bar-Yosef (1994)	9950 ± 100	11,554 – 11,225	
Jerf el Ahmar	Stordeur *et al.* (2000)	9680 ± 90, 9790 ± 80	11,188 – 10,793, 11,230 – 11,166	
Jericho, PPNA	Burleigh (1981, 1983)	9775 ± 150, 9655 ± 85, 9582 ± 89, 9560 ± 65, 9380 ± 85	11,232 – 11,137, 11,174 – 10,785, 11,159 – 10,697, 11,092 – 10,697, 10,725 – 10,431	
Mureybet, Phases IB-II (Khiamian)	J. Cauvin (1987)	10,590 ± 140, 10,590 ± 140, 10,215 ± 115, 10,005 ± 95	12,888 – 12,346, 12,888 – 12,346, 12,316 – 11,604, 11,688 – 11,255	10,460 ± 200

Table III. Continued

Mureybet, Phase III	J. Cauvin (1987)	9970 ± 115, 9950 ± 150, 9905 ± 115, 9730 ± 150, 9730 ± 140, 9675 ± 110, 9540 ± 130, 9520 ± 150, 9490 ± 120	11,688 − 11,197, 11,637 − 11,226, 11,549 − 11,196, 11,231 − 10,789, 11,195 − 10,772, 11,158 − 10,583, 11,158 − 10,563, 11,229 − 10,793, 11,087 − 10,563	9840 ± 260, 9620 ± 200, 9570 ± 200
Nemrik 9, Phases 1–3	Kozlowski (1994)	10,070 ± 120, 9990 ± 140, 9780 ± 130, 9570 ± 130, 9530 ± 140, 9510 ± 150, 9500 ± 130, 9370 ± 120, 9250 ± 70	11,938 − 11,260, 11,894 − 11,226, 11,256 − 11,116, 11,165 − 10,603, 11,158 − 10,580, 11,156 − 10,561, 11,092 − 10,563, 10,734 − 10,424, 10,551 − 10,251	9970 ± 170, 9870 ± 160, 9800 ± 160, 9780 ± 180, 9770 ± 520, 9770 ± 240, 9640 ± 300, 9630 ± 160, 9490 ± 170, 9480 ± 170, 9440 ± 160, 9230 ± 160
Netiv Hagdud	Bar-Yosef (1991), Bar-Yosef and Gopher (1997)	9970 ± 150, 9780 ± 90, 9780 *pm* 110, 9700 ± 80, 9700 ± 150, 9680 ± 140, 9660 ± 70	11,693 − 11,201, 11,258 − 10,912, 11,230 − 11,162, 11,226 − 10,758, 11,201 − 10,753, 11,195 − 10,889, 11,174 − 10,792	10,180 ± 300,9790 ± 380, 9750 ± 300, 9600 ± 170, 9400 ± 180
Qermez Dereh	Bar-Yosef and Gopher (1997)	9890 ± 120, 9870 ± 140, 9680 ± 100	11,547 − 11,185, 11,547 − 11,171, 11,195 − 10,789	9660 ± 250
Tell Aswad Phase Phase Ia	Delibrias *et al*. (1982)	9730 ± 120, 9640 ± 120	11,227 − 10,871, 11,181 − 10,743	
Wadi Faynan 16	Mithen *et al*. (2000)	10,190 ± 50, 9890 ± 50, 9690 ± 50, 9420 ± 50, 9400 ± 50	12,110 − 11,696, 11,326 − 11,204, 11,174 − 11,093, 10,729 − 10,562, 10,689 − 10,558	
Zahrat adh-Dhra’ 2	Edwards *et al*. (2002)	9490 ± 50, 9470 ± 50, 9440 ± 50	11,056 − 10,603, 11,038 − 10,598, 10,737 − 10,579	

[a] Abberant dates way outside the expected time range of the PPNA and dates considered inaccurate due to early measuring techniques (van der Plicht and Bruins, 2001; Waterbolk, 1987, 1994) are not listed.
[b] Waterbolk (1994, p. 368).
[c] These ages represent the top and bottom age values for one sigma calibration results. These results are presented in Figure 3.

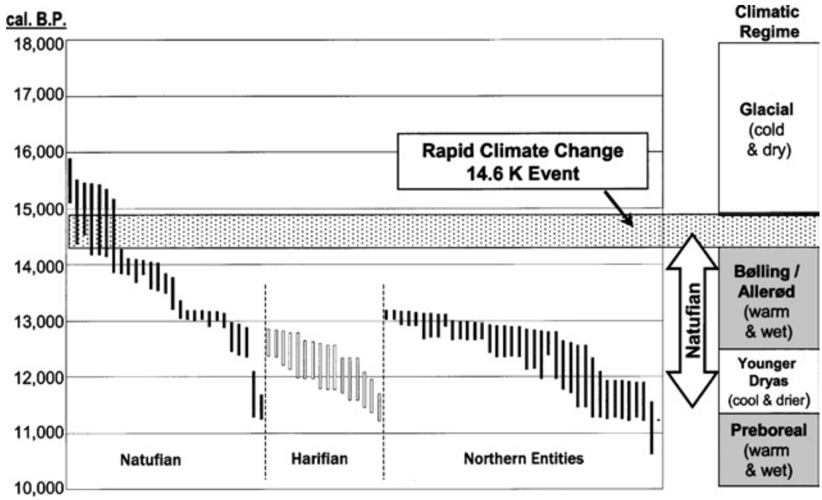

Fig. 2. Distribution of calibrated dates from Late Epipaleolithic sites in the Near East ($n = 81$, 1 standard deviation).

The vast majority of Late Natufian and the Harifian occupation occurred during the subsequent Younger Dryas climatic era.The three northern Levant/Taurus-Zagros Late Epipaleolithic sites have occupation postdating 13,200 cal. B.P., beginning just prior to the start of the Younger Dryas. No sites in this northern portion of the Near East are currently dated prior to 13,300 cal. B.P. Thus Early Natufian developments in the southern Levant do not appear to be paralleled by similar shifts in social organization in the northern Levant and the Taurus-Zagros flanks. The reasons that underlie this situation are unclear at present and may possibly reflect a lacunae in the currently available evidence. If current evidence indeed reflects a lack of intensive occupation in the northern Near East, then this time lag in social developments may be in part tied to dissimilar environmental conditions.

Figure 3 presents 74 radiocarbon dates available from 18 PPNA period occupation phases. Five dates are from two occupation phases assigned to the initial Khiamian phase of occupation (see Table III). These dates (one from Hatoula and four from Mureybet) represent four of the five earliest PPNA dates, and at one standard deviation they occur within the Younger Dryas era and prior to the onset of the Preboreal climatic event. Dates from the Late Epipaleolithic Mureybet phase IA and PPNA Mureybet phases IB-II overlap considerably, and the wide range of dates from Halan Çhemi straddle the Late Epipaleolithic/Early Neolithic boundary. Of the 69 non-Khiamian dates from 18 PPNA sites, only one date on unidentified wood charcoal from Wadi Faynan 16 precedes the Preboreal climatic event at one standard deviation (see Table III and Fig. 3).

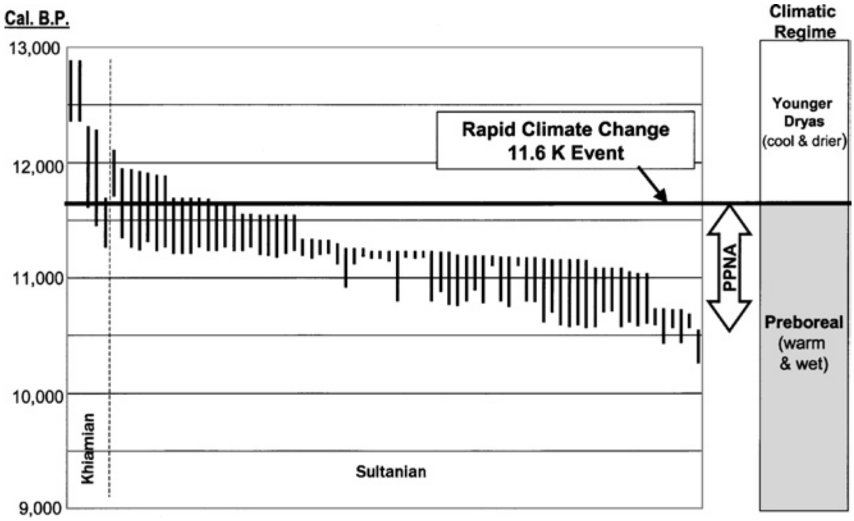

Fig. 3. Distribution of calibrated dates from PPNA sites in the Near East ($n = 74$, 1 standard deviation). Note scale is two times Figure 2.

These calibration results clearly reveal that the onset of PPNA village life during the Sultanian (also referred to as the Aswadian and Mureybetian in the central and northern Levant) subphase is well dated and well correlated with the Preboreal or second rapid warming event 11,570 ± 10 cal. B.P. Moreover, this process occurred in various places throughout the Levant as well as along the Taurus-Zagros flanks, occurring over a much larger area than Early Natufian developments. While correlation is not causation, it is clear, however, that Early Natufian sedentism and then PPNA early village life flourished immediately after rapid improvements in climate initiated by the Bølling and Preboreal events (see also Bar-Yosef, 2000b; Bar-Yosef and Belfer-Cohen, 2002; Harris, 2002).

SOCIOECONOMIC DEVELOPMENTS IN TEMPORAL CONTEXT

The radiocarbon dates indicate a correlation between the onset of the Bølling and then Preboreal climatic regimes and the two fundamental social milestones. Thus these two sudden social developments—sedentary hunting and gathering and then 3000 years later food-producing village life—occurred in resource-rich settings during favorable climates rather than under environmental stress or in areas with marginal resources. Each of these warm and wet periods provided a medium for new adaptive strategies to begin, to flourish, and to entrench themselves, and to spread throughout all aspects of society and ultimately over a much wider region.

Thus prior models that emphasized environmental stress cannot explain these developments; clearly attention must be focused on social dynamics and changes in social-ideological interaction taking place at times of climatic amelioration to understand how and why it happened.

To begin to understand why and under what conditions these specific organizational choices were made, the regional context needs to be examined at the transition to the Holocene. Initially, discussion concentrates on the Levant, because this portion of the Near East has the most detailed Epipaleolithic archaeological record and is the heartland of the Natufian. The subsequent Early Neolithic section is more evenly balanced between the Levant and the Taurus-Zagros flanks given the substantive and important research results in the latter region.

Early and Middle Epipaleolithic

Numerous terms have been proposed to distinguish Levantine cultural entities during the 9000 cal. year period prior to the Late Epipaleolithic, many of which have temporal and spatial limits (see Byrd, 1994a; Fellner, 1995; Henry, 1995). On the broadest scale of classification this time range is referred to as the Early and Middle Epipaleolithic, and we currently lack strong insights into social organization and regional trends. In the Levant, the most detailed information comes from the semiarid steppe and desert regions (most notably, the Negev of southern Israel, the Azraq Basin of eastern Jordan, and the northern Hisma of southeastern Jordan, and to a lessor extent the el Kowm basin of eastern Syria) (e.g., Byrd, 1998; Goring-Morris and Belfer-Cohen, 1997; Henry, 2002). Less detailed and systematic regional information is available for the Mediterranean forest region of the Levant, and we virtually have no insight into occupation of the Taurus-Zagros flanks during this time period (e.g., Özdoğan, 1997). Thus social reconstructions for this time period are, by necessity, quite speculative and subject to considerable revision in the future.

By the Middle Epipaleolithic, hunter-gatherers exploited all portions of the Levant and a series of preadaptations set the stage for the Natufian (e.g., Bar-Yosef and Belfer-Cohen, 1989; Byrd, 1998, n.d.; Goring-Morris, 1995; Goring-Morris and Belfer-Cohen, 1997; Henry, 1995, 1997). Early and Middle Epipaleolithic sites were typically small (25–400 m^2, with a single occupation event generally 25–50 m^2 in area) and occupied for short periods of each year. Architecture primarily involved the use of perishable materials. Tool kits were generalized, and infrequent ground stone included mortars, pestles, and bowls. Rarely preserved plant remains include a wide range of locally available wild plants (Garrard, 1999). Notably, hard-coated grasses (including emmer wheat and barley), legumes, fruits, and nuts were exploited at Ohalo II near Lake Tiberius in the southern Levant at the start of the Early Epipaleolithic (Kislev *et al.*, 1992). Burials rarely have been recovered and only at the largest sites, and grave goods are infrequent. Artwork is extremely rare. The presence of trade goods, typically small Mediterranean and Red Sea gastropod beads, reveals interaction between groups over considerable distances.

Available surveys showing the location of sites and excavations at representative sites in the southern Levant indicate that the dominant settlement pattern consisted of large territories (the size of which varied depending on regional patterns in resource availability) occupied by a series of small, residential groups of probably 10–20 people (e.g., Bar-Yosef, 1998d, p. 146). These groups moved their residential camps several times each year in patterns that varied depending on the local setting (Goring-Morris, 1995; Henry, 1997, 2002). Several extremely large sites, such as Wadi Jilat 6 (Garrard and Byrd, 1992) and Kharaneh IV (Muheisen, 1988), were occupied in the southern Levant. These sites may well represent settings where larger populations briefly coalesced together annually (Garrard and Byrd, 1992; Goring-Morris, 1995). Such aggregation events would have been pivotal for social maintenance, marriage networks, resolving conflicts, and the performance of major ceremonies, a pattern noted ethnographically among hunter-gatherers (e.g., Lourandos, 1997). The population size of these aggregation groups is uncertain, but it was undoubtedly correlated with the minimum number needed to maintain a biological group and had implications for the territorial range of these hunter-gatherer groups, which overall was large.

Given this, several trends from the start of the Early Epipaleolithic through the Middle Epipaleolithic served as important preconditions for Early Natufian social interaction. First, the number of sites increased over time, sites were distributed across a wider range of ecological settings, and more diverse ecological niches were exploited. Some residential sites in very favorable settings such as Neve David (Kaufman, 1992) and Ein Gev IV (Bar-Yosef, 1981), as well as large aggregation sites such as those mentioned above, may have been occupied for longer periods of time each year. The advantages of these extended encampments and aggregations would have been evident with respect to cooperative procurement events, including game drives. These trends may possibly indicate a long-term shift to population growth, and, if so, there was the potential for strains on the carrying capacity. There also are indications of increasing regionalization in stylistic motifs on hunting tools (namely microliths) and trade goods (notably shell beads) during this same time frame. All this suggests that the size of group territories may have been reduced from the onset of the Early Epipaleolithic through the Middle Epipaleolithic. Given this reconstruction, it is possible the adaptive system in play for a long period of time prior to the Late Epipaleolithic may have been showing strains around the margins because of slow but steady population growth (Rosenberg, 1998). Much more research is needed, however, to clarify the full nature of regional patterns of social interaction at the end of the Middle Epipaleolithic (e.g., Henry, 2002).

Late Epipaleolithic

The onset of the Late Epipaleolithic began around 14,600 cal. B.P. when the climate dramatically warmed and rainfall increased. Climatic amelioration was first realized in the Mediterranean forest of the southern Levant as resource-rich annuals flourished and increased at the expense of perennials (Hillman, 1996; van Zeist and Bottema, 1991). At the same time, sea and lake levels (such as Lake Lisan in the Jordan Valley) were rising dramatically (Bar-Yosef, 1996), and burning was no longer a useful strategy for increasing food supply as it would have decreased the extent and productivity of progressively more abundant annuals (Hillman, 1996). Late Epipaleolithic sedentism began initially in the resource-rich center of the Mediterranean woodland, the most spatially bounded area, and is represented by the Natufian culture complex (Fig. 4) (Bar-Yosef, 1998c; Bar-Yosef and Meadow, 1995; Bar-Yosef and Valla, 1991; Henry, 1991; Lieberman, 1993; Valla, 1995). Currently, prehistoric settlement in the northern Levant contemporary with the Early Natufian has been only infrequently encountered and is undocumented along much of the Taurus-Zagros flanks (Cauvin, M. C., 1987; Esin, 1999).

Early Natufian sedentism was the result of social decisions that broke dramatically from prior Epipaleolithic adaptive strategies and included significant changes in intracommunity social interaction as well as changes in intercommunity relationships. It entailed settling down in multigroup aggregates for at least nine months per year (the exact duration per year is debated and no doubt varied over time) and focusing more heavily on exploiting annual wild grasses, legumes, and nuts (Bar-Yosef, 1998c, 2001a; Bar-Yosef and Valla, 1991; Belfer-Cohen, 1991; Henry, 1989; Valla, 1995). Cooperative labor tactics may have been used to gather abundant wild resources such as nuts, cereals, and legumes that were mature for only a short time and would rot if not collected quickly. These resources would then have to be stored for later consumption during the unproductive portions of the year (late summer and winter).

Sedentary Natufian sites were strategically placed at the junction between different environmental zones, enabling a wider range of resources to be readily exploited (Henry, 1989). The sites were generally larger than 1000 m^2 (Bar-Yosef, 2001a), with perhaps as many as 60 inhabitants. These sedentary sites were often located at prominent "places" on the landscape, such as caves or rockshelters, that were unoccupied in the Middle Epipaleolithic or situated directly adjacent to the most prominent springs. It is possible, although not demonstrated by empirical evidence, that these choices in site location may have had a symbolic element, effectively as territorial marking events, and these sites may have been viewed as having a sacred component (see Lourandos, 1997). The caves and rockshelters had the additional advantage of having an interior suitable for ritual events, storage, and if need be defense.

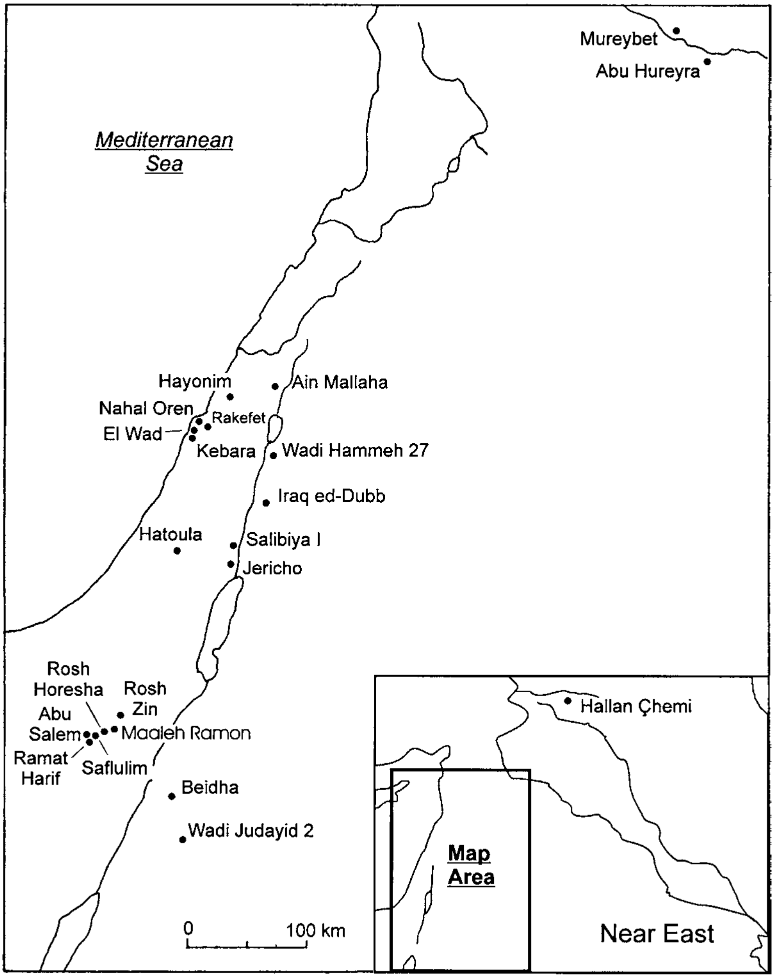

Fig. 4. Map of Levant showing location of prominent Late Epipaleolithic sites mentioned in text.

A diverse subsistence technology, including the use of new tools such as sickles, was focused on foods requiring more time and energy to collect, process, and store. Plants, particularly annuals, became much more important than before based on several lines of evidence including limited archaeobotanical and bioarchaeological evidence (Bar-Yosef, 1998c; Henry, 1989; Lieberman, 1998; Lieberman and Bar-Yosef, 1994; Valla, 1998). An elaborate array of ground stone tools, dominated by mortars and pestles, along with bedrock mortars have been recovered in much higher frequencies than from Middle Epipaleolithic sites. Hunting using the bow and arrow (with lunates on the latter) included all sizes of available game, entailed intensification of large game hunting (especially of gazelle), and smaller game such as birds and fresh water fish were also more frequently exploited. There also was a tremendous increase in tools made of bone, including sickles, gorges for hunting, and numerous awls indicating a rich basket-making tradition (Belfer-Cohen, 1991; Campanna, 1991).

These developments necessarily would have entailed profound changes in social interaction, including increasingly complex social obligations and scheduling. Details are unclear because of the nature of archaeological data, but these changes were reflected in the widespread use of expressive art as evidenced in tools, items of personal adornment, figurines, and building decoration (Bar-Yosef, 1997; Bar-Yosef and Belfer-Cohen, 1999; Marshack, 1997; Valla, 1995). This outburst of symbolic expression emphasized the natural world with the regular use of the meander pattern and zoomorphic imagery in three dimensions, while human images were uncommon and genderless. It also included incised bone and limestone objects that may have contained encoded information (Bar-Yosef and Belfer-Cohen, 1999). These symbolic developments had significant cognitive and religious meaning and value as stridently advocated by Cauvin (1994, 2000). Although the interpretive potential has yet to be fully realized, symbolic expressions of this nature may have played an important role in reinforcing new forms of social interaction.

For the first time, Near Eastern hunter-gatherers buried their dead in organized cemeteries within and around these sedentary sites. This development suggests a new way of illustrating ancestral ties to the land (Bloch, 1971; Kuznar, 2003). Items of personal adornment were regularly placed in many Early Natufian graves. Moreover, these items were very different from those recovered from pre-Natufian sites. Previously, it has been suggested that these burial patterns and practices indicate a social hierarchy and hereditary elites (Henry, 1989; Wright, 1978). More recently, scholars have suggested that Natufian mortuary practices were instead related to changes in social meaning and ritual practices (Belfer-Cohen, 1995; Byrd and Monahan, 1995; Valla, 1996) or have emphasized the difficulty of understanding the symbolic meaning of ancient mortuary practices (Boyd, 2001, 2002).

Early Natufian mortuary practices were clearly complex and probably served, in part, to mark intricate age-grade and sex distinctions that helped bind these larger communities together within a set of increasingly complex social obligations (Byrd and Monahan, 1995). The oldest adults have no grave goods at all, perhaps indicating they have moved through all the age-grade stages, a process noted ethnographically in other contexts such as among Loikop pastoralists of northern Kenya (Larick, 1987) and among Arapesh agriculturalists in New Guinea (Tuzin, 2001). There also was regional variation in social and symbolic aspects of mortuary practices, including avulsion, ornamental caps, beads, and other decorative motifs (Belfer-Cohen, 1995; Bar-Yosef and Belfer-Cohen, 1999).

Another important social change had to do with interaction between neighboring communities. This entailed widening the range and scope of trade networks, including dentalium shell beads, ochre, malachite, and notably basalt for large ground stone tools (Runnels and van Andel, 1988; Weinstein-Evron *et al.*, 2001). Recent sourcing research has revealed that basalt for Natufian ground stone tools was most often acquired from distant sources, up to 100 km away, rather than local sources (Weinstein-Evron *et al.*, 1999). From this it can be deduced that trade played an important role in building alliances and maintaining good relations with neighboring populations (Kaufman, 1992; Weinstein-Evron *et al.*, 2001).

There was also a series of byproducts of Early Natufian sedentism. Architecture became permanent and built of stone. Early structures were large and often had several hearths at regular intervals within a single building (Valla, 1995, 2000) and may have housed multiple families (Byrd, 2000). Storage facilities were rare, and stored food was probably kept in baskets. Trash built up rapidly in the sedentary sites, effectively creating a new environmental niche. This "garbage" niche attracted a variety of small animals, and three of our modern companions (the house mouse, the rat, and the house sparrow) emerged as distinct species in a process termed commensalism (Tchernov, 1991). Thus it is not surprising that the dog was domesticated during this period (Tchernov and Valla, 1997); at times it was sacrificed and then buried with humans (Valla, 1995).

We now have good insight into where complex hunter-gatherers first emerged in the Near East (in the Mediterranean forest of the southern Levant), when it happened (around 14,600 cal. years ago), and in what context (in the most resource-rich area of the Near East during a favorable climatic period). Our understanding of how and why it happened is much less certain. Recent developments do, however, help refute some prior explanations. Resource stress resulting in population pressure was not the direct cause since sedentary hunter-gatherers emerged during good times (Rosenberg, 1998). Nor is the retreat of hunter-gatherers from the semiarid Negev a result of environmental decline at the start of the Late Epipaleolithic to create a form of population packing and the Natufian (Bar-Yosef and Belfer-Cohen, 1989) a viable explanation since environmental conditions were improving.

External factors (such as population pressure or environmental change) alone are not sufficient to explain these profound developments, although certainly environmental improvements at the start of the Late Epipaleolithic created new opportunities. Instead, I suggest that changes in social interaction (both at the intragroup and intergroup level) lie at the heart of why and how complex hunter-gatherers emerged in the southern Levant. The onset of new patterns of social interaction was not crisis driven nor forced on local populations but was socially driven during a period of relative resource abundance. This set of conditions provided a context in which prior, relatively egalitarian rules of interaction that had served to constrain and control social interaction (as they are imperfectly reflected in earlier Middle Epipaleolithic settlements) were reduced and/or superseded. Thus enterprising individuals, perhaps community leaders, may have been able to capitalize on a spontaneous set of external events around 14,600 cal. years ago to address long-standing difficulties that hunter-gatherer groups had periodically encountered in regional and community interaction.

This entailed exploiting resources that had been part of the foraging spectrum during earlier periods by placing considerably more time and effort on these now more plentiful plant resources. Cooperative labor tasks were well suited to gather these resources, prepare them for storage, and produce storage containers/facilities. There also was now a direct correlation between the time and effort put into these activities and the investment yield. As a result, more food resources were available during subsequent portions of the year than were available in prior times. In this context, labor became an extremely important aspect of social interaction, and the ability of a group (or individuals within a group) to entice more people to participate in these activities would have been very important and a highly respected skill. The resulting food stuffs were effectively a form of surplus suitable for creating social obligations, establishing new forms of social interaction, and building and enhancing alliances. This would have provided a context in which community leaders were able to expand their roles and enhance their prestige.

But why were Early Natufian groups able to circumvent or alter existing rules of social interaction? First, it is likely that these new economic activities did not, at least initially, take away an individual's or a family's ability to obtain traditional yields of these seasonal food stuffs. Instead, this new strategy emphasized collection intensification where a greater yield was obtained per unit of land. Second, it is probable that this new economic strategy did not just benefit individuals or single families but had obvious benefits to larger social units. Thus social interaction appears to have entailed larger group participation in more cooperative endeavors and included intergroup interaction. This new strategy of resource intensification also was advantageous to Early Natufian groups because it reduced their territorial range and thereby lowered potential for conflict and stress with adjacent groups over boundary issues (Rosenberg, 1998). It also secured territory and group ownership of key resources, provided a resource that could be used as social capital, and at the same time greatly increased the complexity of social interaction. In this context, pre-Natufian rules governing property ownership (and possibly property inheritance) may have been altered, and this provided the impetus and justification for production intensification.

Of course, the details of precisely how this happened are unclear at present; available evidence indicates that change was not incremental but occurred rapidly at the start of the Natufian and that the nature of social interaction, social rules and institutions, and ideology differed markedly from that evident during the Middle Epipaleolithic. Rapid social change is typically very hard to demonstrate archaeologically (Adams, 2000), particularly in a Late Pleistocene context.

This perspective that rapid change occurred at the start of the Natufian is bolstered by the lack of sites with a transitional phase and that no Early Natufian sites have an underlying Middle Epipaleolithic occupation (although there is a lack of Middle Epipaleolithic sites well dated to immediately prior to the Late Epipaleolithic).

The Natufian lasted for 3000 years, and during the latter half sedentary sites became distributed over a wider geographic region including the northern Levant (Cauvin, 2000; Cauvin *et al.*, 1997; Moore *et al.*, 2000) and the Taurus-Zagros flanks (Rosenberg and Redding, 2000). The antecedents of these new northern Levantine and Taurus-Zagros sedentary hunter-gatherer settlements remain uncertain. Whether this lacunae is a result of mobile prehistoric occupation patterns or the movement of populations from the east (Rosenberg, 1999) or north (Özdoğan, M., 1999) will require additional field research to fully clarify. There also has been considerable discussion recently on whether the Late Natufian in the southern Levant remained sedentary or were more seasonally mobile as a result of increased climate-induced stress during the Younger Dryas (Bar-Yosef, 2001a; Belfer-Cohen and Bar-Yosef, 2000; Valla, 1995). Spatially, settlement patterns varied greatly during the course of the Late Epipaleolithic, and it is highly likely that they also varied temporally although much more work is needed to fully understand these trends.

Additional social changes occurred gradually during the Late Natufian (Kuijt, 1996). Domestic structures in the southern Levant became smaller than during the Early Natufian and contained only a single hearth, indicating they may have been the residences of individual families (Byrd, 2000). These architectural changes may well reflect the first steps toward increased household autonomy. Important new insights into community-wide organization have been obtained recently from the Late Epipaleolithic site of Hallan Çemi on a tributary of the Tigrus in the Taurus-Zagros flanks. At this small sedentary hunter-gatherer community, both small residential structures and larger, possibly nonresidential structures were uncovered (Rosenberg *et al.*, 1998; Rosenberg and Redding, 2000). These large structures have been interpreted as public buildings, and a variety of nonutilitarian items are associated with related nonresidential contexts.

Late Natufian mortuary patterns also differ markedly from the Early Natufian, as grave goods were now absent and group burials predominated over individual burials (Belfer-Cohen, 1995; Byrd and Monahan, 1995). Although it is difficult to fully understand the implications of these archaeological data, new mortuary practices may have served to enhance community-wide harmony and promote an egalitarian ethos (Kuijt, 1996). Overall, these developments were undoubtedly a consequence and outgrowth of extended sedentary life during the Late Epipaleolithic and the more complex social relationships that it entailed.

Adaptive patterns varied, temporally and spatially, in ways that are not fully agreed on nor understood at present. The final byproduct of Late Epipaleolithic sedentism and resource intensification was cultivation, as documented at the site of Abu Hureyra in the northern Levant (Hillman *et al.*, 2001; Moore *et al.*, 2000). The site was set in an ecotone at the junction of the riparian and steppe with open park woodland in the Middle Euphrates River Valley. Excellent preservation of carbonized plant remains and a rigorous recovery plan by Andrew Moore yielded a remarkable range of plant species. Hillman's (2000) analysis demonstrated year-round occupation and reliance on a few key plant species. Around 13,000 cal. B.P., 500 years after this sedentary site was established, there was a decrease in the park woodland/woodland steppe, making wild cereals and fruits less available perhaps because of the onset of cooler and drier conditions during the Younger Dryas. Rye and possibly wheat then began to be cultivated as indicated by a sudden increase in a range of weedy species (Hillman, 2000). Domesticated rye is documented 400 years later based on the presence of a small number of larger grains that have been directly dated. This reconstruction of Late Epipaleolithic cultivation has been given broader support by Colledge's (1998, 2002) multivariate analysis of archaeobotanical data that indicated cultivation at the nearby site of Mureybet. Some archaeologists, however, prefer much stronger evidence before they will accept Late Epipaleolithic cultivation and domestication (Harris, 2002; Nesbitt, 2002).

It is uncertain how regionally extensive cultivation was during this period, for how long it took place, and how many different plants were cultivated, in large part because Natufian sites in the southern Levant typically have poor preservation of carbonized plant remains. It is likely that the relative reliance on particular species was highly varied throughout the Near East and that cultivation experiments may have been underway in a variety of settings. For example, at Hallan Çemi, wild legumes and nuts appear to dominate the carbonized plant remains while wild cereals are very rare (Rosenberg *et al.*, 1998). This may reflect social decisions or, probably more likely, a dearth of locally available annual cereals given this late Epipaleolithic site's distance from the Mediterranean woodland refugia (Hole, 1998). Rosenberg *et al.* (1998; Rosenberg and Redding, 2000) also have suggested that pigs were undergoing domestication at Hallan Çhemi, although this interpretation has been questioned (Ervynck *et al.*, 2001; Peters *et al.*, 1999). Regardless, resource intensification was taking hold with respect to certain animal species as wells as plant species.

Thus the earliest evidence at present for plant cultivation and plant domestication is in the Late Epipaleolithic during the Younger Dryas, a period of worsening climatic conditions. Although climatic stress has been the most common reason cited for the onset of cultivation in the Late Natufian (Bar-Yosef, 2001a; Moore and Hillman, 1992; Moore *et al.*, 2000), other possible explanations include population increases at sedentary sites or the overexploitation of local environments. Late Epipaleolithic cultivation was probably supplemental and limited in extent, and served as a risk abatement strategy (Redding, 1988). Moreover, Late

Epipaleolithic subsistence strategies appear to have been highly varied and tailored to locally available resources.

Early Neolithic

The second social milestone, the onset of large food-producing villages during the PPNA, was the result of decisions that broke significantly from the Late Epipaleolithic socioeconomic system. This unprecedented development occurred 11,600 cal. B.P., soon after dramatic increases in temperature, and rainfall, and further changes in the distribution and density of annual cereals and legumes. This entailed aggregating in potentially larger groups, shifting settlement locations to areas with a high water table, and conducting plant cultivation buffered from a complete dependence on rainfall (Bar-Yosef, 1991, 2001a; Bar-Yosef and Meadow, 1995; Cauvin, 2000; Kuijt and Goring-Morris, 2002). This unprecedented scheme created multiple new niches outside the primary habitat of the plants being manipulated and allowed for much larger communities than previously (3–8 times the largest Natufian site); the largest villages ranged from 2 to 5 ha in size and may have housed up to 300 individuals (Bar-Yosef 2001a, p. 18; Bar-Yosef and Meadow, 1995, p. 62). Most, but not all, of these large PPNA sites lack an underlying Late Epipaleolithic component (although some have a Khiamian phase). At Mureybet and perhaps other sites in the northern Levant and Taurus-Zagros flanks, however, occupation continuity occurred from the Late Epipaleolithic to the PPNA (Biçakçi, 1998; Cauvin *et al.*, 1997). The precise nature of occupation between 12,000 and 11,600 cal. B.P., a period often characterized as Khiamian Neolithic (but which also includes dates from a few Late Epipaleolithic sites) remains an important but unresolved issue.

These early food-producing settlements were not numerous but were very widely distributed (Fig. 5). PPNA village sites are currently documented on both sides of the Jordan Valley, in the Damascus Basin, along the Euphrates River, and along the Tigris River and its tributaries in southeast Turkey and northern Iraq (Bar-Yosef and Gopher, 1997; Edwards *et al.*, 2002; Kozlowski, 1990; Mithen *et al.*, 2000; Özdoğan, A., 1999; Stordeur, 2000; Watkins *et al.*, 1989). These early villages, practicing extensive plant agriculture, were rarely situated in the ecotones chosen by the Early Natufian for their collector-based hunter-gatherer strategy. Instead, the large PPNA sites were typically located near the margins of the steppe, near marshes, along lake margins, on alluvial fans, and beside river banks where considerable land could be cleared for cultivation; high water tables made harvests more reliable and productive; and larger surpluses could be produced.

Well-preserved archaeobotanical remains reveal a diverse diet, with cereals being important, most notably barley in the south and wheat elsewhere (Bar-Yosef, 1991; Garrard, 1999; Kislev, 1992; Wilcox, 1996). This is correlated with a shift in processing emphasis from pounding by mortars and pestles, ideally suited to a diverse nut/legume/cereal emphasis in the Late Epipaleolithic, to grinding with hand stones and slabs (Wright, 1991). The diet, however, remained relatively diverse with smaller animals such as tortoise, lizards, and birds, and especially water fowl very common (Bar-Yosef, 2001a; Cauvin, 2000; Tchernov, 1994). Thus wetland animal resources became a key source of fat and protein.

Recent excavations at PPNA sites reveal that changes in social dynamics that began in the Late Epipaleolithic were further elaborated on in these Early Neolithic villages (e.g., Kuijt, 1996; Stordeur, 2000). Trade increased, trade networks expanded across wider distances, and new types of goods such as cowrie shells, natural tar, and obsidian were exchanged (Bar-Yosef and Meadow, 1995;

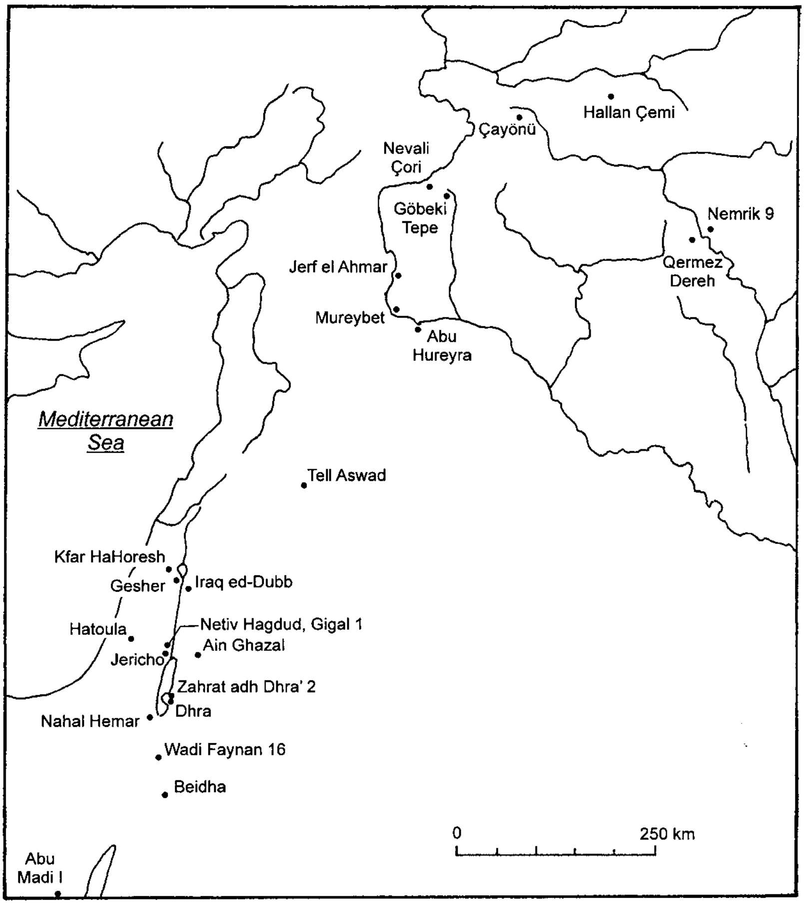

Fig. 5. Map of Near East showing location of prominent Early Neolithic sites mentioned in text.

J. Cauvin, 2000; M. Cauvin, 1998). Residential structures were more standardized in size and form, typically made from mud brick or wattle and daub with stone foundations, and often contained silos for storing grain (Bar-Yosef and Gopher, 1997; Byrd, 2000, 2005; Kuijt and Goring-Morris, 2002; Stordeur, 2000).They were often rebuilt, one building on top of previously occupied buildings, creating tells.

Community-wide PPNA construction events created public architecture, of which the best known are the wall, ditch, and tower from Jericho in the southern Levant (Kenyon, 1981). Recent extensive salvage excavations at Jerf el Ahmar in the northern Levant have revealed remarkable new insights into this topic. Domestic architecture evolved from round to rectangular during the PPNA occupation at Jerf el Ahmar, and public buildings are well documented during the latter PPNA and transitional PPNA-PPNB contexts (Stordeur, 2000; Stordeur *et al.*, 2000). Two late PPNA phases of occupation at Jerf el Ahmar (during which aboveground rectangular domestic buildings were present) each include a large, round, subterranean building divided into radiating cells with raised benches and wooden pillars. The first of these two public building had a headless skeleton on the floor and two human skulls at the base of a posthole, whereas the subsequent public building contained a skeleton lacking a skull and vertebrae, with a skull in a room corner. The large, round, subterranean public building in the subsequent occupation level, assigned to the PPNA-PPNB transition, lacked internal subdivisions, but its raised bench contained decorated stone slabs that included a continuous raised design depicting a serpent (Stordeur, 2000, p. 3).

Additional changes in social interaction occurred during the PPNA and are reflected in symbolic imagery. Cauvin (1978, 1994) pioneered this topic in the Near East, asserting that ideological developments preceded agriculture and that the emergence of deities (manifested as goddesses in human form and bulls) was necessary for humans to fundamentally change their relationship with the natural world. Cauvin's influential and provocative thesis has been recently updated and translated into English (Cauvin, 1997, 2000) and subjected to considerable discussion (Bar-Yosef, 2001b; Cauvin, 2001; Hodder, 2001; Rollefson, 2001; Verhoeven, 2002a; Wakins, 2001; Wright, 2001). Recent exciting new discoveries at Neolithic sites also have prompted further consideration of psychocultural developments. Expressive art shifted from the Natufian heavy emphasis on the natural world to a remarkable and diverse set of Early Neolithic human (both male and female) and animal images as figurines, statues, and on stelae. Ideological changes also are indicated in mortuary practices (Kuijt, 1996, 2000b, 2001b). In the southern Levant, burials typically lacked grave goods and were often placed under the floors of buildings. Many burials later had the skulls removed, presumably for display, and then the skulls were reburied, often in clusters (Belfer-Cohen and Aurensberg, 1997; Kuijt, 2000b).

Similar to the start of the Natufian, we now have better insight into when, where, and in what context larger PPNA villages emerged (around 11,600 cal. years ago in a variety of Near Eastern settings during a favorable climatic period), while insights into precisely how and why it took place are not well developed at present. Part of this difficulty is that our knowledge of social interaction during the prior 400–500 years (often referred to as the Khiamian) is weak. Yet the establishment of these large, food-producing villages was not based on the "invention" of cultivation, since cultivation began in the Late Epipaleolithic, perhaps as much as 1500 years earlier (at Abu Hureyra, later at Mureybet, and possibly at other sites as well). Nor was it the result of environmental perturbation since the environment improved markedly at this point in time. Furthermore, it was not solely due to the ascendance of more productive, domesticated plants since major improvements in plant genetics occurred subsequently and villages in different portions of the Near East were relying on varied cultivated plants.

The widespread occurrence of large communities emphasizing food production around 11,600 cal. years ago was the result of fundamental changes in social discourse and interaction. These developments built on and also departed from the social rules and institutions that emerged at the start of the Late Epipaleolithic and that had been subsequently modified during the time period from 14,600 to 11,600 cal. B.P. A decisive and innovative economic strategy, in all likelihood leadership-driven, was undertaken that capitalized on the improved environment at the start of the Holocene. This entailed further resource intensification through land-modifying plant cultivation in new settings, more labor investment in activities such as planting and tending of agricultural plots, greater yields, and expanded storage requirements since seeds were needed for the next season's planting.

This land use strategy would have disproportionately benefitted the most ambitious family units, as it provided greater surpluses that were controlled by individual households, as well as community leaders and household heads, since it expanded and enhanced their role within the community on several levels. Notably, this entailed a codification/formalization of a social strategy for food production. The organizational structure of communities was further altered away from an orientation on the group to an emphasis on family-based production units.

This process was anchored by rules of ownership governing property, access to resources, and stressed the importance of inheritance in a manner that forever changed the social landscape. Fundamental changes in social interaction occurred within these larger food-producing units with respect to the division of labor, the location and nature of processing and storage, and intercommunity exchange patterns. The family became the fundamental unit of production in terms of the allocation of tasks among individuals, and the family-based rules became codified with respect to production and control over stored goods. An inherent aspect of family-based production was the greater potential for some families to be more successful as a result of such factors as having larger plots of land, having access to land that provided higher yields, or having a larger family. Thus there was a greater likelihood for divergence in wealth, status, and power between family units.

This fundamental reorganization of social life was tied to the importance of the annual agriculture cycle, its impact on human perceptions of the environment, and the social implications of living within larger communities. These changes in intracommunity discourse were reflected in the spatial organization of the community and the built environment (that reveals greater spatial discreteness between domestic strictures and, on occasion, distinctive public facilities) and the growing importance of ritual activities in structuring interpersonal relationships. Ideology and symbolic imagery played an important role in establishing and then reinforcing this new form of social discourse, in terms of social relations within and between families and also between the community and the world around them. For example, mortuary practices reflected the growing importance of ancestors in ritual activities as access to productive plots of land became more restricted (Bar-Yosef, 2001a; Bar-Yosef and Meadow, 1995; Kuijt, 1996). New Neolithic images had potent symbolic meaning and reveal complex ritual and ideological patterns that varied considerably between regions within the Near East (Bienert, 1995; Verhoeven, 2002a, 2002b).

An important aspect of this process undoubtedly included an enhanced role for community leaders, possibly elites, in managing the complexities of agricultural village life, in dealing with questions of scale within these larger communities, and in resolving an increased number of intracommunity disputes. Currently, there is little archaeological evidence (such as differential burial treatment, greater household size, or access to and control of prestige goods) during the PPNA to demonstrate the presence of leaders or elites. Instead, the presence of leaders is inferred based on the need for managers to organize substantial community-wide labor events documented at some Early Neolithic sites. Ideology may have provided a venue for leaders to garner greater power and authority by conducting elaborate rituals, maintaining control over ritual knowledge and paraphernalia, and "ensuring" the success of each step in the agricultural process (including those done by humans and the result of nature, such as timely rainfall). Thus leadership roles were legitimized through ideology.

These trends in early village life continued and are currently best documented during the subsequent PPNB period. The PPNB witnessed ritual and symbolic elaboration, the addition of herd animals to the economy over a wide region, considerable population growth, and much larger settlements of which some have even been called towns (Bar-Yosef, 2001b). Social organization became more complex, with increasing household autonomy and further evidence of suprahousehold decision making (Byrd, 1994b, 2000, 2005; Kuijt, 2000a; Kuijt and Goring-Morris, 2002). Increased divergence in the character of social interaction became more evident within the Near East, particularly between the southern Levant and the Taurus-Zagros region.

The built environment of PPNB communities included distinctive and typically larger public buildings; these structures have been discovered wherever excavations have exposed a large percentage of the site. Well-documented examples include Çayönü and Nevali Çori in the Taurus-Zagros flanks, and Beidha in southern Jordan (Byrd, 1994b, 2000, 2005; Hauptman, 1988; Özdoğan and Özdoğan, 1998). Some of these buildings were clearly connected to mortuary practices, while others, sometimes at the same site, no doubt were the venue of other community-wide interactions (Byrd, 1994b; Hole, 2000; Verhoeven, 2002a).

More complex and elaborate sets of visual imagery associated with mortuary rituals and intra- and intercommunity interaction also occurred during the PPNB (Cauvin, 2000; Kuijt, 2000b, 2001b; Verhoeven 2002a, 2002b). A growing body of iconography, such as human statues and busts made of plaster in the southern Levant (Rollefson, 1986, 2000), suggests much more complex symbolic expressions that are difficult to fully grasp given the limits of archaeological data. A novel aspect of this process that has become widely recognized in recent years entails the presence of sites dominated by nonresidential activities. These include the small cave site of Nahal Hemar south of the Dead Sea (Bar-Yosef and Alon, 1988), the open air site of Kfar HaHoresh in the lower Galilee area (Goring-Morris, 2000), and the large hilltop site of Göbeki Tepe in southeastern Anatolia (Schmidt, 2000).

Göbeki Tepe, one of the most remarkable Early Neolithic sites, has been interpreted as a regional aggregation center for ritual and ceremonial activities (Schmidt, 2000). The 9-ha site comprises a series of occupation levels from the middle PPNB back into the PPNA (Hauptmann, 1999; Schmidt, 2000, 2002a, 2002b). The upper Neolithic level (II) consists of a series of rectangular structures while the underlying level (III) contains oval structures. None of these PPNB buildings is considered a residential structure, although a wide range of wild animal remains, wild plant foods, and lithics have been recovered at the site. These buildings have been characterized as nondomestic and monumental and include terrazzo floors and T-shaped monolithic pillars, some set in the walls, others freestanding. The limestone pillars, some of which are fully intact at a height of 5 m, include a variety of animals (including lions, foxes, aurochs, and cranes) depicted in carved relief (Schmidt, 1998). At times one animal dominates the depictions in a single building. Some of the buildings appear to have been intentionally buried during occupation, a task involving at least 300 m^3 of fill (Schmidt, 2002b). Although the population catchment for this ritual center is unknown, the site's extent and the labor involved in construction activities suggests a fairly large-scale network of social interaction and alliance. Moreover, other sites with similar attributes have recently been recognized in the Taurus-Zargros regions, most notably, the large, 32-ha site of Karahan Tepe 50 km to the east that includes 266 in situ pillars visible on the surface (Çelik, 2000).

Ritual practices related to mortuary activities also were elaborated on during the PPNB. Skulls were modeled with plaster and elaborately decorated with other materials in the Levant, and it has been conventional wisdom to consider these skulls to be only older adult males that were community elders (Arensberg and Hershkovitz, 1989). Osteological research by Bonogofsky (2001), however, has revealed that the skulls of females, young adults, and some children also were selected for specialized treatment (see also Verhoeven, 2002a, 2002b). Recent research at Kfar HaHoresh in the southern Levant has revealed unique insights into regional interaction with respect to mortuary activities (Goring-Morris, 2000; Goring-Morris *et al.*, 1994–1995). Lime-plastered surfaces, a wide range of human mortuary remains (including two plastered skulls) in varied contexts and at times associated with animals' remains (typically gazelle and aurochs) have been found. Burials of men, women, and children are documented, and Goring-Morris (2000) has proposed that these individuals were only a select portion of the population from a series of nearby early food-producing villages. This suggests the potential for social ranking despite the relatively egalitarian indications from residential sites in the southern Levant (Byrd, 1999, 2000).

These recent findings highlight the extremely important role that ritual played in both intracommunity and regional interaction during the Early Neolithic. They also reveal that our understanding of the interplay between social interaction, regional alliances, and ideology during the Early Neolithic is still weak. Much more research is needed to comprehend how these aspects of early village life were intertwined and how they varied across the Near East.

SUMMARY

Figure 6 summarizes this reassessment of social change in the Near East associated with the origins of food production. The first social milestone (complex sedentary hunter-gatherers) began suddenly 14,600 cal. B.P. at the start of the Natufian in the southern Levant. It entailed resource intensification associated with a clear-cut reorganization of settlement patterns, population aggregation, and an increased emphasis on wild cereal and legume gathering. This restructuring was socially driven, created food surpluses that were used as social capital that largely benefitted the group as a whole, and involved major changes in social interaction and ideology.

Once initiated, sedentism ultimately led to a series of further, gradual changes in social interaction across a wider region a thousand years or so later contemporaneous with the Late Natufian. Cultivation also began around 13,000 cal. B.P. Initially, cultivation was undoubtedly a supplemental economic activity that enabled sedentary groups exploiting naturally occurring resources to maintain the relative dietary input of cereals and legumes. This occurred as demand increased

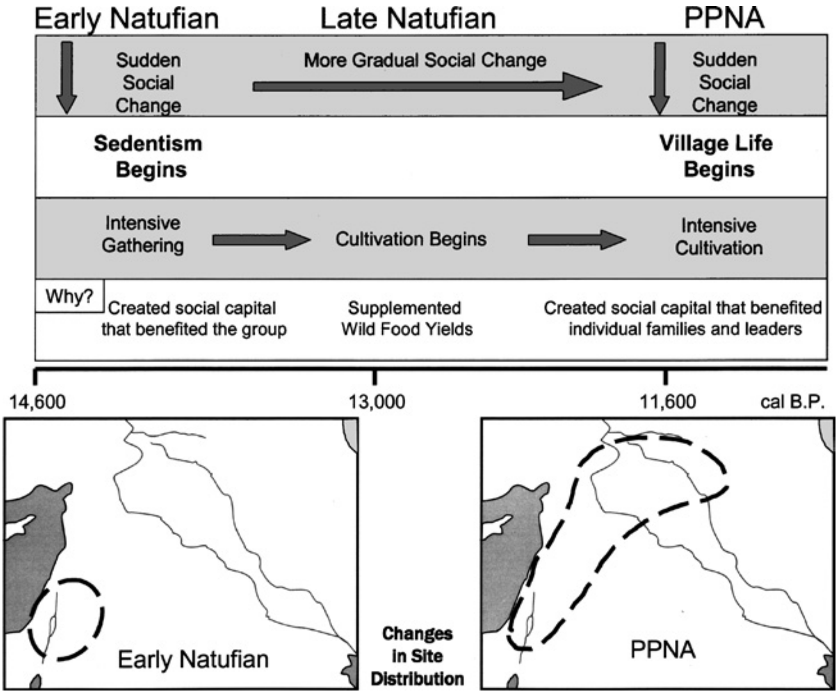

Fig. 6. Summary of social and economic changes and setting for Early Natufian and PPNA developments in the Near East.

and the areas near sedentary settlements were providing insufficient wild-food yields. Extent of this experimentation is unclear at present but is best documented at Abu Hureyra in the northern Levant (Moore *et al.*, 2000). A very important part of this Late Epipaleolithic process that remains uncertain is the nature and extent of interaction between sedentary hunter-gatherers living in larger communities and more mobile hunter-gatherers inhabiting adjacent areas, particularly in the northern Levant and the Taurus-Zagros flanks.

Village life, the second social milestone, then emerged abruptly 11,600 cal. B.P. during the PPNA. This occurred over a more extensive portion of the Near East including the Taurus-Zagros flanks. It entailed the creation of multiple new niches, intensive plant cultivation, and allowed larger populations to live together. The impetus for the establishment of these food-producing villages was a socially motivated strategy that created greater surpluses, explicitly positioned the family as the primary unit of production, and afforded greater power and prestige to community leaders and household heads. In doing so, how humans interacted with each other and their environment was profoundly reconfigured.

These two social milestones share a series of characteristics in common. Both occurred immediately after the onset of better environmental conditions in areas where potential productivity was the highest. Both entailed resource intensification through the investment of more labor to obtain higher yields and surpluses from smaller segments of the landscape. In doing so, buffer zones were created between the territories of adjacent groups, and this may have reduced the potential for intergroup conflict. Both events also included fundamental changes in social interaction, social institutions, and ideology. Change during both periods was not incremental but rapid. Thus it is possible that rapid environmental change at the end of the Bølling and at the onset of the Preboreal climatic regimes served as catalysts for leaders or enterprising individuals to justify creating new solutions for addressing existing problems. In doing so, leadership roles were enhanced with the formation of more elaborate forms of social discourse.

CONCLUSION

Clearly, a series of ecological and social preconditions converged in the Near East at the end of the Pleistocene (Sherratt, 1997). The sudden onset of complex, sedentary hunter-gatherers at the start of the Early Natufian was the first step in a process of remarkable changes in settlement pattern, food procurement strategies, community size, social interrelationships, and ideology. These developments led gradually to further alterations and elaborations in social interaction and economic strategies including initial cultivation. These subsequent, more gradual developments during the Late Epipaleolithic laid the institutional and organizational framework for the dramatic emergence of Early Neolithic village life and intensive cultivation that forever reconfigured how humans interacted with each other and the world around them. Until late in the PPNB, economic strategies were highly situational and resulted in multiple local domestication events (including perhaps of the same species) within the Near East. At the same time, social and ideological developments also varied regionally within interaction spheres but were increasingly occurring at the same tempo. Thus the conditions under which complex hunter-gatherers, cultivation, and village life emerged in the Near East have become clearer; this reassessment is consistent with all currently available evidence although, clearly, many pieces of the puzzle are still missing.

So what are the broader implications of this Near Eastern reconstruction for the origins of food production? First, as noted by McCorriston and Hole (1991), universal models designed to explain this process have tended to look only at known variables held in common by all pristine settings. None of these general models is widely accepted, and each either has notable flaws or lacks empirical verification.

Since the origins of social complexity and food production are clearly more complex than once envisioned, it is better at this stage to examine major regions and individual areas within them in more detail to determine what really are the main variables in each case. Once this is done, it is predicted that there will be no universal path to food production, but rather that there will be conditions and processes that are similar in many, if not all, situations (Price and Gebaur, 1995b; Smith, 2001a, 2001b).

Future research would benefit from concentrating more on how social complexity emerged among hunter-gatherers to fully understand how and why food production began (Arnold, 1996; Hayden, 1996, 2001). Logically, this shifts the focus of archaeological inquiry away from explaining just a small number of pristine cases where food production began to exploring the origins of hunter-gatherer social complexity on a broader geographic scale. One advantage to this approach is that a much larger number of case studies can be studied worldwide, in contexts where early social complexity remained entirely a hunter-gatherer occurrence, and in contexts where it led to food production (Arnold, 1996). This will allow us to discern more accurately and more quickly the key variables in the process.

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