Journal of World Prehistory, Vol. 18, No. 3, September 2004 (© 2004)
DOI: 10.1007/s10963-004-4361-9

Beyond Boundaries: Nature, Culture and a Holistic Approach to Domestication in the Levant

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The main objective of this paper is to suggest an alternative approach for the investigation of domestication in the Levant. First, basic data regarding domestication in the Levant are presented. Then the various traditional approaches towards domestication in the prehistoric Levant, labeled (1) environmental, (2) social and anthropological, and (3) cognitive, are briefly reviewed. This discussion forms the basis for a proposal of a "holistic approach," in which domestication is regarded as a long-term, multidimensional and multirelational phenomenon, including many elements—such as plants, animals, humans, material culture and ancestors—with increasing human manipulation of these various constituents. After a presentation of the theoretical framework, a growth *metaphor is used to reconstruct the process of domestication (ca. 20,000–6500 B.P.) as a number of phases: (1)* germination *in the Kebaran; (2)* development *in the Early Natufian; (3)* retreat/dormancy *in the Late/Final Natufian; (4)* growth *in the Pre-Pottery Neolithic A; (5)* florescence *in the Early- and Middle Pre-Pottery Neolithic B: (6)* further development *in the Late Pre-Pottery Neolithic B; (7)* dispersal *in the Final Pre-Pottery Neolithic B and the Pottery Neolithic. In each of these phases, relations between the various elements are dealt with, special attention being paid to symbolical relations, as evidenced by "art" and ritual.*

KEY WORDS: domestication; Levant; Epipaleolithic; Neolithic; nature and culture; holism; ritual; symbolism.

More things grow in the garden than the gardener sows

—Spanish proverb

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INTRODUCTION

The process of domestication of plants and animals in the Levant, and the Near East in general, has been the focus of archaeological and anthropological research for a long time now, resulting in an enormous quantity of publications. The main research objectives with regard to domestication are to identify *where, when*, *how* and *why* domestication occurred. Generally speaking, theories about domestication tend to approach the phenomenon from rather specific perspectives. These are what may be loosely termed environmental, social and anthropological and cognitive. Within environmental approaches, which are by far the most numerous, the natural environment (especially climate) and ecological and economic relations between humans, plants and animals come to the fore. Social and anthropological theories are critical of the environmental determinism which characterizes the former approaches, and pay particular attention to social aspects such as social structure, exchange and human agency. In cognitive approaches, it is especially the human mind or the symbolical, cognitive and psycho-cultural dimensions of domestication that receive attention (Fig. 1).

Each of these groups of theories focuses on important aspects for understanding domestication, and within each group valuable insights have been generated. While environmental, social, and, to a lesser extent, cognitive factors have been incorporated in theories about the origins of food production, one dimension—nature or culture—is usually taken to be active and deterministic, the other dimensions being largely passive, or adaptive, or both. In other words, as will be shown by a survey of old and current approaches towards domestication, most of the approaches are based on either environmental determinism or cultural determinism.

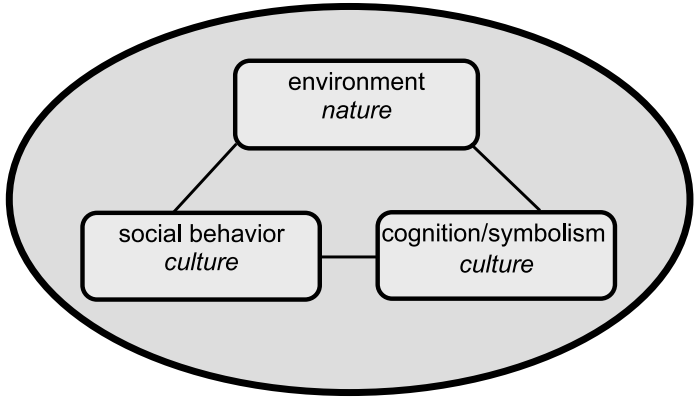


Fig. 1. Traditional explanatory dimensions and relations of domestication.

This contribution starts out from the assumption that domestication in the Levant was a holistic and multi-faceted phenomenon: not ecological, social or cognitive, but involving all of these dimensions, in different combinations and degrees of importance at different times. Furthermore, it will be argued that domestication involved more than just economic relations between humans, plants and animals. Moreover, it is felt that the causes and effects of domestication can only be understood by following it through time, as a long-term, historical process. From the outset, I wish to make it clear that I do not pretend to offer a new theory about domestication. Rather, I intend to pay attention to some factors which are not so commonly dealt with. In other words, I would like to present a building block, to be added to the foundations laid by others, which I hope will result in a more complete theory of the process of domestication.

The paper consists of five main parts. First, the environmental, chronological and cultural context is briefly introduced. Second, basic facts about domestication are dealt with. Third, a representative selection of the various "traditional" approaches towards domestication is discussed. Fourth, I present the theoretical framework of a holistic approach. Fifth, this approach is applied to an analysis of the process of domestication in the Levant.

THE ENVIRONMENTAL, CHRONOLOGICAL AND CULTURAL CONTEXT

The main emphasis in this contribution is on one of the areas which has been most intensively investigated with regard to domestication: the Levant, consisting of Israel, the Palestinian Autonomous Authority, the Sinai peninsula of Egypt, Lebanon, Jordan and southwestern Syria, but other regions (e.g. southeastern Anatolia) will receive attention as well.

The dating of archaeological periods is largely based on Kuijt and Goring-Morris (2002, Table I), Bar-Yosef (2002), and Bar-Yosef and Belfer-Cohen (2002). Dates are given both as uncalibrated and as calibrated dates B.P. (cal B.P., calibration according to INTCAL98 (Stuiver *et al*., 1998)). The evidence for the paleo-environment and climate in the Levant mainly derives from the analysis of pollen cores from lakes and swamps, deep-sea cores, geomorphological data, stalagmites, and plant and animal remains from archaeological sites (e.g. Baruch and Bottema, 1991; Bottema, 2002; Frumkin *et al*., 1999). Table I summarizes the paleo-climatic stages in the Upper and Terminal Pleistocene and Early Holocene in the Levant. It appears that the transition from the Pleistocene to the Holocene was a period of marked climatic fluctuation. These changes are largely the result of cyclical switches in the earth's orbit of the sun: the Milankovitch effect.

Table I. Paleo-Climate in the Levantine Upper and Terminal Pleistocene and Holocene[a]

Date (cal B.P.)	Period	"Culture"	Climate
22,000–18,500	Early Epipaleolithic: Last Glacial Maximum	Early Kebaran Late Kebaran	Cold and dry, lakes in isolated basins receded or dried up (but winter rainfall in the forested coastal regions)
18,500–14,500	Middle Epipaleolithic	Geometric Kebaran Mushabian Ramonian	Climatic improvement, probably first in southern Levant and later in Anatolia, expansion of lakes and start of gradual rising of sea level (until the Middle Holocene)
14,500	Late Epipaleolithic: Bölling-Alleröd	Early Natufian	Warm and wet phase: increase in rainfall over the entire region, peaking at 13,500 cal B.P.
12,800–11,500	Late Epipaleolithic: Younger Dryas	Late/Final Natufian Harifian	Short deterioration, followed by wet conditions, followed by the Younger Dryas: a (sudden) harsh cold and dry period
11,500–9,000	Neolithic: Early Holocene	PPNA PPNB	(Rapid) return to warm and pluvial conditions, Mediterranean climate of hot summers, warm winters and seasonal rainfall
9,000–8,500	Neolithic: Middle Holocene	EPPNB/MPPNB LPPNB/FPPNB/PPNC	Moister than today Warming and drying trend

[a]Based on Bar-Yosef (2002, pp. 113–114), Bar-Yosef and Meadow (1995, pp. 44–45), Baruch and Bottema (1991), Goring-Morris and Belfer-Cohen (1998), Mackay *et al.* (2003), Rossignol-Strick (1993), Sanlaville (1996), Tchernov (1998), Wilkinson (2003).

In particular, the melting of the large continental ice sheets at the end of the Pleistocene resulted in alterations in the weather, and of course in a global rising of sea levels (Bintliff, 1982; Wilkinson, 2003; Wright, 1993). McCorriston and Hole (1991), among others, have argued that there was a marked increase in the seasonality of precipitation at the beginning of the Holocene (ca. 10,000 B.P., 11,500 cal B.P.). This resulted in the Mediterranean climate of hot and dry summers and cold and rainy winters.

With regard to topography, the modern Levant can be divided into four north–south oriented longitudinal zones consisting of (1) a narrow coastal strip; (2) the western hills and mountains; (3) the Jordan Rift Valley; (4) the Syro-Jordanian plateau, which gradually merges with the Syrian-Arabian desert (Bar-Yosef and Belfer-Cohen, 1989a; Byrd, 1989). These zones roughly correspond to four main geo-botanical zones: (1) *Mediterranean* forest primarily consisting of oaks, pistachios, pines and annuals; (2) *Irano-Turanian* steppe, consisting of dwarf shrubs, shrubs and herbs; (3) *Saharo-Arabian* desert with annuals only near sources of water; (4) *Sudanian* desert, with a savannah-like and tropical vegetation. Generally, the climate changes from Mediterranean in the west to continental and desert in the east and south (Byrd, 1989; Wilkinson, 2003; Zohary, 1973, but see Blumler, 2002). These vegetation zones only roughly correspond to those of the Terminal Pleistocene and Early Holocene (van Zeist and Bottema, 1991). Fluctuations in rainfall and, to a lesser degree, temperature, such as those described earlier were responsible for the expansion and contraction of these zones: "the present is only a partial key to the past" (Blumler, 1996, p. 30).

The period of interest is the Late Pleistocene and the Early Holocene (ca. 20,000–6500 B.P., 23,700–7300 cal B.P.), i.e. the Epipaleolithic and the Neolithic. The use of grinding tools in the Early Epipaleolithic, most likely for processing seeds, marks the beginning of this long period. The Epipaleolithic cultural complexes are the Kebaran (Early and Middle Epipaleolithic) and the Natufian (Late Epipaleolithic). The Neolithic consists of the Pre-Pottery Neolithic A (PPNA), the Pre-Pottery Neolithic B (PPNB), and the Pottery (or Late) Neolithic periods. The emphasis within this long period is on the Natufian and the Pre-Pottery Neolithic, which, as will be argued, have been the most crucial periods for the process of domestication.

BASIC DATA

Before discussing the various approaches to domestication, it is important to provide some basic definitions and data, especially on the domestication of plants (focusing on cereals) and animals.

Definitions

Generally, a distinction is made between the domestication of plants and animals and the domestication of humans and society. The first type of domestication may conveniently be described as the adaptation of animals and plants to life in intimate association with and to the advantage of man (Merriam-Webster's Online Dictionary), or "the human creation of a new form of plant or animal—one that is identifiably different from its wild ancestors" (Smith, 1998, p. 18).

Alternatively, in his influential book *The Domestication of the Human Species*, Wilson (1988, p. 4) defines "domesticated humans" as "those who live (and mostly work) in houses grouped together in hamlets, villages, towns, etc., as distinct from people who use temporary dwellings, or no dwellings at all (i.e. Palaeolithic hunter-gatherers) and people who live in large cities and work in factories, offices, and so on." Interestingly, also in the early seventeenth century the word "domesticate" related only to humans, in the sense of civilizing or becoming part of a household (Leach, 2003, p. 356). Yen (1989) speaks about "the domestication of the environment," indicating hunter-gatherer manipulations of the landscape. In my own approach, which will be presented later, domestication is regarded as a multidimensional and relational phenomenon, including many entities such as plants, animals, humans, material culture and ancestors.

Domestication, cultivation and agriculture are closely related, but it is important to distinguish between them. As used here, *cultivation* refers to the intentional preparation of fields, sowing, harvesting and storing seeds or other plant parts; *agriculture*, or farming, is the combined subsistence practice of plant cultivation and animal husbandry.

Cereals

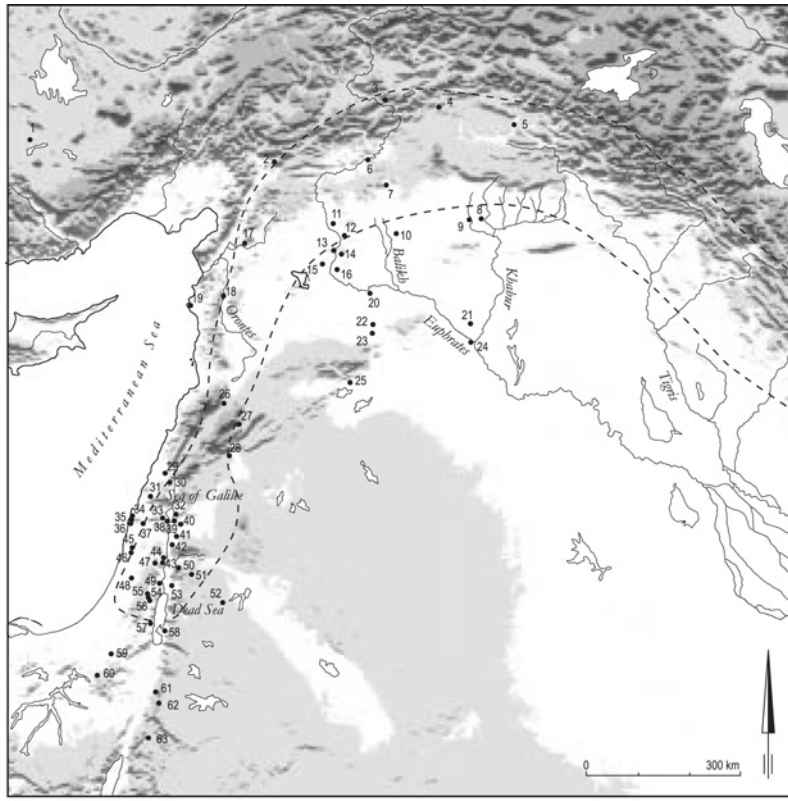
Cereals are annual grasses cultivated for their grains. The first plants to be cultivated in the Near East were emmer wheat (*Triticum turgidum* sp. *dicoccum*), einkorn wheat (*Triticum monococcum*) and barley (*Hordeum vulgare*), followed by pulses: pea (*Pisum sativum*), lentil (*Lens culinares*), legume crops: chickpea (*Cicer arietinum*), bitter vetch (*Vicia ervilia*). Flax (*Linum usitatissimum*) also belongs to this "package." These are the so-called founder crops or "first wave" domesticates (Zohary, 1996; Zohary and Hopf, 2000). Apart from flax and barley, the wild ancestors of these annual plants have a rather limited distribution, i.e. the famous Fertile Crescent, ranging from the Levant (Israel) via southern Anatolia to the Zagros mountains in Iran in the east. In the north and east it is bounded

by forested mountains, in the west by the Mediterranean, and in the south by vast steppes and deserts (Fig. 2). Most often, a combination of cereals, pulses and flax marks early farming villages.

Cereals are among the so-called r-selected species, which typically are small, short-lived, highly productive, and resistant to overexploitation (i.e. reliable food resources), as opposed to K-selected species, which consist of large-bodied animals with a high energy return, but a lower rate of productivity (less reliable food resources; Hayden, 1990, p. 32; Henry, 1989, p. 15). Cereals are highly productive and grow in dense stands. The wild cereals are, among other things, marked by easily shattered ears with brittle rachises, which allows effective seed dispersal. Cultivation, including cutting with sickles or uprooting, however, results in an (unconscious) selection of plants with tough rachises, since the brittle plants will shatter and thus not be included in the harvest, partly to be sown next year. Moreover, the non-brittle mutants become dependent on humans for their survival. The main indications for domestication of grain are changes in morphology, size and toughness of rachis fragments. It should be realized that the early stages of domestication (whether of plants or of animals) may be "invisible," due to the fact that no morphological changes may result. Thus, there always seems to be a time lag between the first actual domestication and its visibility in the archaeological record. On the other hand, experiments by Hillman and Davies (1990) have shown that after no more than 25 years morphological changes may occur in cultivated wild species. They have concluded that after three centuries of human cultivation emmer wheat, einkorn wheat and barley could have become fully domesticated.

The question of monophyletic or polyphyletic cultivation and domestication has long intrigued archaeobotanists (Zohary, 1996; Zohary and Hopf, 2000). Recently, Willcox (2001) has found evidence for important differences between Late Pleistocene and Early Holocene sites from different regions with regard to cereal assemblages. He concludes that the differences are due to local variation in wild populations. Thus, geographically independent domestication events can be discerned for different species. Moreover, he points out that the exploitation of cereals, eventually leading to domestication, was a very gradual (and dynamic) and long-term process, with wild and domesticated cereals sometimes occurring side by side.

Most likely, cereals and pulses were grown in small mixed-crop, shifting-field systems of cultivation, especially on lowland alluvial soils, but also on higher "hilly flanks." Fire, simple flood-irrigation and periods of fallow may have been used to keep the soil fertile (Harris, 2002, p. 72).



1	Catalhöyük	▲▼	19	Ras Shamra	▲▼	36	Kebara Cave	×	54	'Ain Sakhri	✦
2	Domuztepe	▼	20	Abu Hureyra	✦▲	37	Kfar Hahoresh	▲	55	Erq el-Ahmar	✦
3	Cafer Höyük	▲	21	Sinn	▲	38	Ohalo II	×	56	El-Khiam	■
4	Çayönü	▲	22	Umm el-Tlel	×	39	Sha'ar Hagolan	▼	57	Nahal Hemar	▲
5	Hallan Çemi	✦■	23	El Kowm	✦	40	Iraq ed-Dubb	■	58	Dhra'	■
6	Nevali Çori	▲	24	Bouqras	▲▼	41	Wadi Hammeh 27	✦	59	Rosh Zin	✦
7	Göbekli Tepe	■	25	Douara	×	42	Saidiyeh	▼	60	Rosh Horesha	✦
8	Kashkashok	▼	26	Labweh	▼	43	Gilgal	■	61	Beidha	✦▲
9	Seker al-Aheimar	▲▼	27	Yabrud III	✦	44	Salibiya IX	■	62	Basta	▲
10	Sabi Abyad	▼▲	28	Aswad	▲	45	Wadi Raba	▼	63	'Ain Jammam	▲
11	'Abr	■	29	Beisamoun	▲	46	Nahal Qanah	▼			
12	Dja'de	▲	30	'Ain Mallaha	✦	47	Netiv Hagdud	■			
13	Halula	▲▼	31	Hayonim Cave and Terrace	✦	48	Hatoula	✦■			
14	Jerf el Ahmar	■				49	Jericho	✦■▲▼			
15	Nahr el-Homr	×	32	Ein Gev I	×	50	Wadi Shu'aib	▲			
16	Mureybet	✦■	33	Gesher	■	51	'Ain Ghazal	▲▼			
17	Dederiyeh	▼	34	Nahal Oren	✦■	52	Kharaneh IV	×			
18	'Ain el-Kerkh	▼	35	El-Wad	✦	53	Tuleilat el-Ghassul	▼			

× Kebaran
✦ Natufian
■ PPNA
▲ PPNB
▼ Late Neolithic

Fig. 2. Map of the Near East with selected key sites of the Epipaleolithic and Neolithic periods, and indication of the "Fertile Crescent": that is, the present-day distribution of wild wheat (based on Nesbitt, 2002).

It is traditionally assumed that the first evidence of morphologically domestic plants in the Near East is from PPNA sites in the (southern) Levant. However, recent research has cast serious doubts on this assertion. For instance, according to Kislev (1992) most of the presumed domestic barley seeds in Netiv Hagdud (and Gilgal) were collected from wild stands. Like the remains from Netiv Hagdud, the status of the barley recovered from Jericho is not entirely clear. At Jerf el Ahmar, probable domestic grain stems from a transitional PPNA/PPNB phase (Willcox, 2004a). Aswad offers better evidence for domestication, but on the basis of recent excavations Stordeur (2003b) has convincingly argued that the so-called PPNA levels (*niveau* IA) are in fact Middle (perhaps Early) PPNB. Iraq ed-Dubb (9950 B.P., 11,500 cal B.P.) seemed a good candidate for the domestication of emmer wheat and barley (Colledge, 2001), but even this claim has recently been questioned by Nesbitt (2002, 2004) in a critical review of the evidence for domesticated plants at Epipaleolithic and aceramic sites in Southwest Asia. On the basis of a re-analysis of grain shape, chaff morphology and radiocarbon dates, Nesbitt concludes that the earliest secure evidence (chaff) for plant domestication is presented by three well-dated Early PPNB sites (ca. 9200–9000 B.P., 10,400–10,000 cal B.P.) in southeastern Anatolia: Nevali Çori, Çayönü and Cafer Höyük. Likewise Cappers *et al*. (2002, p. 3) contend that "the first domesticates appeared from the Early PPNB onwards." Thus, according to these "long-gestation" models (cf. Colledge *et al*., 2004, p. 38), there was a considerable time span between the cultivation of wild species in the Natufian and the first secure evidence of domestic crops in the PPNB. As will be argued later, this new and convincing claim is of considerable importance for our understanding of agricultural origins and the Neolithic.

Animals

The PPNB provides the first evidence for domestic ungulates: goats (*Capra hircus*), sheep (*Ovis aries*), pigs (*Sus scrofa*) and cattle (*Bos taurus*). The main characteristics that distinguish domestic animals from their wild ancestors are diminished sexual dimorphism, diminution in brain, body and horn size, changes in the shapes of horns and changes in color. Most researchers agree that animal domestication was the outcome of a number of steps of increasing intensification of human–animal relations (Bökönyi, 1993; Horwitz 1989; Jarman *et al*., 1982; Harris, 1996a, 2002; Tchernov, 1998; Zohary *et al*., 1998, see also Peters, 2004). Horwitz (1989), for instance, has suggested a four-phase model, consisting of (1) generalized hunting; (2) incipient domestication (intensive hunting: animals determine human movement; and population isolation: humans determine animal

movement); (3) domestication (artificial selection and unidirectional morphological change); (4) husbandry. Another basic assumption is that the domestication of plants and the emergence of farming-villages was a necessary step before animal domestication in the Early- and Middle PPNB (e.g. Bar-Yosef, 2000; Harris, 2002). Obviously, humans and animals compete for grain, but once herds could be controlled and crops defended (by boundaries, for example), the ungulates provided clear advantages: they consumed stubble, straw and other by-products of grain cultivation; they provided dung as a fertilizer; they were a secure source of meat, milk and other products ("walking larders," cf. Clutton-Brock, 1989); they could be used as draft animals.

Goats were the first animals to be domesticated. At Ganj Dareh Tepe in the Zagros mountains of Iran, there is evidence of domestic goat around 9000 B.P. (10,000 cal B.P.; Zeder and Hesse, 2000). At Jarmo in Iraq, goats seem to have been present around ca. 8700 B.P. (9800 cal B.P.). Sheep were domesticated between ca. 8700 and 8200 B.P. (9800–9200 cal B.P.). Instead of the Zagros, the geographical focus has now become the Taurus mountains in northern Mesopotamia and southeast Anatolia (e.g. Cafer Höyük, Çayönü, Abu Hureyra, Tell es Sinn, Bouqras, Ras Shamra). It has been argued that goats were domesticated in the southern Levant during the Early-Middle PPNB (Horwitz, 1989; Wasse, 1997), but according to recent analysis of mitochondrial DNA of the genus *Capra*, it is more likely that goats were domesticated in the northern Levant (Manceau *et al*., 1999). Most researchers assume a gradual spread from the Taurus and Zagros to the Levant. The earliest evidence for the domestication of pigs comes from bones dating to 8500 B.P. (9500 cal B.P.) at Çayönü. Redding and Rosenberg (1998) have suggested that pigs were specifically maintained by breeding at Epipaleolithic/PPNA Hallan Çemi in Anatolia at ca. 10,000 B.P. (11,500 cal B.P.), but this is still controversial. Again, the focus of animal domestication seems to have shifted; the other sites with the earliest evidence of pig domestication (for example, Cafer Höyük, Aswad, Ras Shamra, Labweh) are mainly located in the northern and northeastern Levant. Cattle, finally, were domesticated late in the PPNB, certainly around 7500 B.P. (8250 cal B.P.) in central Anatolia and the Levant, but perhaps somewhat earlier (Ducos, 1991; Helmer, 1992; Legge, 1996).

From the Middle PPNB, and especially the Late PPNB onwards, grain agriculture and caprine pastoralism ("agro-pastoralism") became firmly established in the Levant and Middle East. Sheep and goats were probably managed in mixed herds, daily pastured and confined in pens or corrals at night. Possibly, seasonal transhumance was practiced in the Late PPNB. Pigs and cattle may have been managed in "free-range" systems (Harris, 2002).

Facts

The following archaeological facts are key factors for understanding domestication (Braidwood, 1960; Hayden, 1995, pp. 277–278; Price and Gebauer, 1995, pp. 7–8; Smith, 1998, p. 210):

- plants and animals that were to become part of agriculture were already important in human subsistence prior to their domestication, and the technology for harvesting, processing, etc. had already been developed;
- (semi-)sedentism preceded the domestication of plants and animals;
- the cultivation and domestication of plants started in the natural habitat of wild cereals;
- agriculture appeared in areas with (a broad spectrum of) abundant resources;
- plants were first domesticated near rivers, lakes, marshes or springs;
- agriculture was accompanied by an extended material culture.

TRADITIONAL APPROACHES TO DOMESTICATION

The following is a discussion of old and new "traditional" approaches to domestication. This review aims at giving a selective but representative picture of recent thinking about domestication in the Levant, which will serve as a background for a holistic approach. At the outset, I would like to stress that the present review of traditional approaches to domestication is not an exhaustive account of the literature. In fact, given the mountain of publications, this would be an almost impossible venture. Moreover, it is unnecessary, as there are already many good overviews (Benz, 2000; Cowan and Watson, 1993; Gautier, 1992; Gebauer and Price, 1992; Harris, 1996c; Hayden, 1992, 1995; Henry, 1989; Kislev, 1992; MacNeish, 1992; Miller, 1992; Price and Gebauer, 1995; Redman, 1978; Smith, 1998, 2001; Vasey, 1992). Although often both environmental and social factors are included, it will be shown that ultimately the traditional approaches take either "nature" or "culture" as having been the determining factor for the transition to agriculture. Table II presents a schematic overview of the various traditional approaches.

Environmental Approaches (Nature)

It is convenient to start the review of approaches to domestication in the Levant with the most common and popular perspectives that focus on external, natural, causes or pressures, most often changes in the climate and

Table II. Summary of the Various Domestication Models

Approach/model	Main "trigger" for agriculture	Sequence of events
Environmental approaches		
Oasis model	Desiccation	Desiccation; close associations between plant, people and animals; cultivation and control; domestication
Marginality model (Binford)	Sea level rising, population pressure	Resource abundance; population growth; environmental stress; movement into marginal zones; cultivation; domestication
Younger Dryas models	Climatic deterioration, population pressure	Resource abundance; sedentism/storage; population growth; environmental stress; cultivation; domestication
Seasonality model	Seasonality, source depletion	Resource abundance; sedentism/storage; seasonality; depletion; intensification; domestication
Coevolution model	Coevolution	Incidental domestication; specialized domestication; agricultural domestication
Path-dependent model	Population pressure? Path-dependence, seasonality	Resource abundance; source dependence; sedentism/storage/exchange; cultivation; domestication
Proto-farming model	Sea level rising	Proto-farming since 40,000 years ago; environmental stress; large-scale agriculture
Social/anthropological approaches		
Hilly flanks model	Culture	"Culture was ready"; close associations between plant, people and animals; cultivation and control; domestication
Marginality model (Flannery)	Population pressure	"Broad spectrum revolution," sedentism, population growth, movement into marginal zones; cultivation; domestication
Population pressure model (Cohen)	Population pressure	Population pressure; food stress; agriculture
Population pressure model (MacNeish)	Population pressure/positive feedback system	Natufian: presence of abundant resources; resource specialization; population growth; diminished carrying capacity of circumscribed locales; import of domesticates; *horticulture* (PPNA); further population growth; lower carrying capacity; more farming; *agriculture* (PPNB)
Social relations model	Social competition	Resource abundance; social competition; surplus production; sedentism/storage; cultivation; domestication

Table II. Continued

Socioeconomic competition model	Socioeconomic competition	Resource abundance; socioeconomic competition of "accumulators": feasts; production of "delicacies"/cultivation; domestication
Domesticated society model	Social structure	"Open societies" of hunter-gatherers evolve into "domesticated societies" with a built environment that is structured as well as structures society
Cognitive approaches		
Psycho-cultural models	Transformation of the human mind	"Revolution of Symbols"; alienation; increasing manipulations of the world; domestication
Domus model	Climate, contingency	In the first place, the house acts as a metaphor and mechanism for the domestication of society; domestication a long-term process of increasing control over the wild

subsequently in the vegetation. Commonly, the paleo-environmental reconstructions which are at the basis of these approaches are based on environmental and biological data such as pollen cores (Baruch and Bottema, 1991; Bottema, 2002), deep-sea cores and geo-morphological data (COHMAP, 1988; Grosman and Belfer-Cohen, 2002 and references therein; Richerson *et al*., 2001), plant remains (Cappers and Bottema, 2002; Cappers *et al*., 2002; Ducos, 1991; Garrard *et al*., 1996; Harlan, 1995; Harris and Hillman, 1989; Helmer, 1992; Hillman, 1996; Hillman and Davies, 1990, 1992; Nesbitt, 2002; Sanlaville, 1996; Sherratt, 1997; Willcox, 1996, 2002, 2004a,b; Wright, 1977; Zohary, 1973, 1992, 1996; Zohary and Hopf, 2000; Zohary *et al*., 1998), animal bones (Horwitz, 1989; Horwitz *et al*., 1999; Köhler-Rollefson and Rollefson, 2002; Legge, 1996; Uerpmann, 1996; Wasse, 1997), human remains (Leach, 2003), and, recently, speleotherms (Bar-Matthews *et al*., 1997). Moreover, ultimately most of the environmental approaches have their roots in the important pioneering work of Darwin (1882), Pumpelly (1908), Vavilov (1926), Childe (1928, 1936), Braidwood (1960), Binford (1968), Flannery (1969), and—perhaps less so—Cohen (1977).

Biological Approaches

To begin with, it should be pointed out that some of the most important insights into the origins of domestication have come from the biological and archaeobiological research of the remains of plants and animals. Here I must mention one of the pioneers: Vavilov, a Soviet biologist and geneticist.

Vavilov's work mainly consisted of mapping the distribution of genetic diversity of crop plants all over the world (Vavilov, 1926). Although Vavilov's main conclusion, that centers of genetic diversity mark first domestications, has been proven to be too restricted, his focus on centers of origin (to be found in mountainous regions; see also Sauer, 1952), active fieldwork and genetics laid the foundations for subsequent research. Moreover, he explicitly acknowledged that the cultivation of plants was not only related to environmental circumstances but also to historical facts and human culture.

Nowadays, the biological research for agricultural origins is marked by a large variety of approaches and often sophisticated techniques, including the analysis of macro remains, pollen analysis, AMS dating, scanning electron microscopy, and DNA research. In fact, much of this research by authorities such as those quoted earlier has provided the necessary foundations for the more abstract theorizing about domestication, which is the main thrust of this paper. In general, the biological approaches concern themselves with the *where*, *when*, and specifically *how* questions of domestication. The following approaches, however, try to formulate answers to the, perhaps most intriguing, *why* question.

The Oasis Model

One of the earliest models concerning the origin of agriculture is the oasis (or propinquity) model. Although this theory is commonly ascribed to Childe, it was actually Pumpelly (1908) who first put it forward. As formulated by Childe (1928, 1936), who based himself on then current paleo-climatic reconstructions, the Near East experienced a considerable dry period at the end of the last Ice Age. Due to this desiccation, people and animals ("refugees") were forced around the few remaining water sources: rivers such as the Nile, Euphrates and Tigris, and oases. Grains were available in the rich alluvial deposits, and people may have increased the density of stands by means of simple irrigation techniques and sowing. These early farmers were not necessarily sedentary, and may have visited the oases periodically to harvest the grain. The stubble of the harvested field would have attracted animals which were protected, culled and tamed, resulting in domestication. The animals fertilized the harvested fields with their dung, and provided meat and secondary products. They were also an insurance in times of food scarcity. In short, due to environmental circumstances (desiccation) strong symbiotic relations between people, plants and animals evolved. According to Childe, the emergence of food-producing economies was the greatest economic revolution—the Neolithic Revolution—since the control of fire.

Although we now know that there was no desiccation at the end of the last Ice Age, many aspects of Childe's theory have remained remarkably up-to-date. Three basic aspects of it have been crucial to many models until this day: (1) the Neolithic is still seen as revolutionary by many researchers; (2) climatic pressure—stress—as a trigger is still commonly assumed; (3) it is now evident that plants were the first major organisms to be domesticated; (4) the positive feedback system between grazing animals and crop fields (stubble grazing-dung) and animals as "walking larders" still holds.

Recently, Sherratt (1996) has also presented an oasis model. According to him, the Final Pleistocene and Early Holocene presented a "bottleneck" situation in the Levant, as it was located between rising sea levels in the west and fluctuating desert margins in the east. Between these pressures, the side by side occurrence of different geographical and vegetational zones allowed for the migration of wild cereals from the hills to well-watered lowland locations (oases), where they were eventually cultivated.

The Marginality Model of Binford

In the late 1960s, Binford put forward a model that combined demographics, optimal zones and changes in the physical environment to explain the transition to farming. According to this model, at the onset of the Holocene the world was filled up with people, and population densities in the Near East were high. In optimal habitats, located in regions with abundant natural resources, semi-sedentary groups (the Natufians) would grow significantly. Due to a rising sea level at the time, which resulted in a significant loss of land, populations grew beyond the carrying capacity of the region. This induced migration to less-favorable territories (marginal zones) inhabited by more nomadic hunter-gatherers. In order to meet the increasing demand for food, people would then have moved cereals outside their natural habitat, resulting in selection and ultimately domestication. Thus Binford's scheme of events runs as follows: habitation in optimal zones, population growth, environmental stress, movement into marginal zones, cultivation and ultimately domestication of grain (Binford, 1968).

The Younger Dryas Models

The Younger Dryas models use the same explanatory schemes as the marginality models of Binford and Flannery (see later), as they deal with the relations between sedentarization, population growth and expansion, environmental stress, stress on food resources, the last leading to cultivation

and domestication. As indicated in Table I, the Younger Dryas (ca. 12,800–11,500 cal B.P.) was a cold and dry period that followed on a period of climatic improvement after the Late Glacial Maximum (Grosman and Belfer-Cohen, 2002). The Younger Dryas represents the final climatic event of the Pleistocene, and corresponds to the Late and Final Natufian. In the subsequent Early Holocene (starting with the PPNA period), the climate began to ameliorate.

The Younger Dryas figures prominently in a number of influential current hypotheses about agricultural origins. It was Bar-Yosef and Kislev (1989), Bar-Yosef and Belfer-Cohen (1989a, 1992), and Bar-Yosef and Meadow (1995) who first put forward the Younger Dryas model, but many other researchers regard the Younger Dryas as the major "trigger event" in the process of domestication (e.g. Harris, 1996b, 2002; Henry, 1989; Hillman, 1996; Moore and Hillman, 1992). Here I shall briefly present three of the most influential models: those of Bar-Yosef and co-authors, of Henry and of Harris.

The model of Bar-Yosef and associates consists of two phases. In the first phase (during the Early Natufian) climatic improvement resulted in large "complex" semi-sedentary communities in the Mediterranean zone of the Levant (the "core area" or "homeland" of the Natufian). In the second phase (Late and Final Natufian), the deteriorating conditions of the Younger Dryas were counteracted by two reactions. First, the Late Natufians in the Negev and northern Sinai increased their mobility, resulting in the Harifian culture. Second, in the Mediterranean zone the decreasing yields of wild grains, which supported the sedentary way of life and which had resulted in an expanding population, were met by cultivating the fertile soils near water sources, as indicated by, for example, grinding tools. As indicated by Bar-Yosef and Meadow (1995, pp. 68–69), this model is based on five major variables: (1) rapid environmental changes, such as the Younger Dryas, are regarded as triggers for cultural changes; (2) the Natufians made intensive use of predictable and abundant resources, such as wild grain; (3) reduced mobility ([semi-]sedentism) was encouraged by the abundance and predictability of wild grain and the territorial behavior of local game (the gazelle); (4) there was demographic pressure; (5) technological innovations (for example, sickles), increasing social complexity and intensified economic activities allowed for cultivation. In summary, "The impact of the Younger Dryas is attested by the abandonment of Early Natufian sites and the establishment of Late Natufian settlements, often in new localities beyond the original Natufian homeland. We postulate that the cold and dry Younger Dryas caused yields of natural stands to decrease and, under existing territorial restrictions, increased the motivation for intentional cultivation" (Bar-Yosef and Meadow, 1995, p. 70).

Subsequently, in the PPNA, the climate improved, and sedentary communities were established in the Levantine Corridor from the middle Euphrates through the Jordan Valley and into southern Jordan (Bar-Yosef and Belfer-Cohen, 1989a, p. 484; Bar-Yosef, 2002, Fig. 10.2), where they used the alluvial soils near water ("oases"). In the PPNB, the successful farming way of life, to which domesticated animals were added, led to (further) population growth and diffusion.

In an influential book, Henry (1989) presented a detailed theory explaining the transition from foraging to agriculture. Although Henry also regards the Younger Dryas as a major trigger event, his theory differs from the one just presented in that he rejects what he calls "push hypotheses," which state that hunter-gatherers were pushed to cultivation because of scarcity. Instead, he favors a "pull hypothesis," which says that in the Levant foragers in the Mediterranean zone were pulled to new advantageous resources. This reliance would have led to vulnerability to situations of stress. Henry distinguishes two transitions in the process leading to agriculture. He argues that the first transition, from simple to complex foraging, was caused by the ameliorating climate, resulting in the expansion of the Mediterranean woodlands ca. 13,000 years ago. This resulted in nutritious, easily collectable and storable food resources (such as wild grain, and nuts). This resource abundance resulted in sedentism. In its turn, sedentism led to population growth, as, according to Henry, indicated by for example the increase in the number and size of Natufian sites. The second transition, from complex foraging to food production, was triggered by the Younger Dryas event, causing a decrease of the resources on which Natufians depended. Henry, however, points out that the Younger Dryas was not *the* causal factor; rather, the cause was the inherent instability of the Natufian system. This essentially meant the loss of mobility, resulting in vulnerability to population and resource stress (he even speaks of a "population explosion" (Henry, 1989, p. 41; see also Henry, 2002)). "When confronted with a dramatic rise in their numbers and a marked decline in resources, the Natufians responded with attempts to control population growth, intensify production, acquire new resource lands, and secure their existing territory" (Henry, 1989, p. 52). Accordingly, in the Mediterranean zone, they could only survive by horticulture. As in the previous model, the Late Natufians in marginal areas returned to foraging (now renamed as Harifians).

In a long series of contributions, Harris has dealt with "domesticatory relations" between people, plants and animals (Harris, 1996a,b, 2002; Harris and Hillman, 1989). Harris specifically deals with what he calls the "agro-pastoral transformation"; that is, the integration of crop and livestock production. In a recent paper, he has conveniently summarized the development of agro-pastoralism (Harris, 2002, p. 78–79). Underlying his

"evolutionary" model (Harris, 1996a) is a reliance on the Younger Dryas as a trigger event, a decreasing dependence on wild plants and animals for food, an increasing dependence on domesticated plants and animals for food, and an increasing input of human energy in land exploitation and animal control. Although it does no justice to the richness of his work, the chronological summary of his main conclusions in Table III will suffice as an introduction to his ideas.

Although the Younger Dryas models present attractive explanations, recent research has indicated some important problems in the correlation of deteriorating climate and decreasing stands of wild grain (leading to cultivation and domestication). First, in a discussion of pollen analysis related to early agriculture, Bottema (2002) has pointed out that the assumption of a decrease of wild cereals in the Younger Dryas is not supported (in fact, it is contradicted) by palynological evidence. The pollen curves form the Lake Hula diagram (Baruch and Bottema, 1991) clearly indicate that the absolute numbers of Cerealia-type pollen that precipitated in the Lake increased in the Younger Dryas and the Holocene.

Second, the Younger Dryas models seem to have been based on a small chronological distance between the suggested cultivation of wild plants in

Table III. The Development of Agro-Pastoralism According to Harris (2001)

Period	Subsistence changes
Natufian	Small-scale cultivation of wild cereals and pulses in the Levant, most likely in response to the Younger Dryas
PPNA	Limited expansion of small-scale grain-crop cultivation near well-watered locations, assisted by a return to warmer and wetter conditions. The economy was still mainly based on hunting and gathering
EPPNB/MPPNB	Larger-scale expansion of grain-crop cultivation in western and eastern Fertile Crescent Caprine pastoralism associated with grain cultivation mainly daily pasturing but likely also seasonal transhumance (in the Zagros) Increasing settlement and architectural complexity
MPPNB/LPPNB	Rain-fed shifting cultivation with fallow periods, but also more continuous cultivation and simple irrigation
LPPNB	Introduction of domestic cattle and pigs and diffusion of caprine pastoralism into northern Mesopotamia and south-central Anatolia
LPPNB/Pottery Neolithic	Continuous small-scale cultivation of fruit trees, vegetables, etc. in mixed-crop house gardens within settlements Diverse role of cattle: draft animals, symbols of fertility, consumers of agricultural waste, providers of meat, milk, hides, horn and dung Plough, fields with fixed boundaries Reduction of diversity of human diet, but on the other hand nutritious diet of domestic plant and animal food Milk as weaning food, reducing infant mortality

the Natufian and domestication of grain in the PPNA. However, if the new updated chronology of plant domestication of Nesbitt is accepted, and it seems to be quite rigorous, it seems that the Younger Dryas models are problematic with regard to the domestication of plants. This is because of the large time lapse between these environmental pressures and the new evidence regarding the first reliable dates (in the Early PPNB, ca. 10,400 cal B.P., instead of in the PPNA) for the domestication of plants: about 700 (radiocarbon) years. Such a period is considerably longer than that expected for domestication to evolve and occur. Thus, while *cultivation* may have been a reaction to these events, Nesbitt (2002, p. 124) rightfully asks "why domesticated plants appeared at all, if long-term cultivation of wild plants had been practiced for so long without domestication occurring?"

Third, McCorriston and Hole (1991, p. 47) have pointed out, speaking more generally, that climatic and environmental fluctuations have occurred many times in the past, without inducing agriculture (see also, for example, Watkins, 2002). However, this criticism does not take into account the fact that population pressure is an important element of the Younger Dryas models. Whether one accepts such pressure is another matter.

This brings me to the fourth problem (which is also relevant for many other models): that of Natufian demographic pressure (as envisioned by Henry, Bar-Yosef and their co-authors). Modeling prehistoric demographics, or population densities, is fraught with difficulties: most importantly, unrepresentative archaeological records (Bar-Yosef, 2002, p. 122) but also chronology and the problem of calculating numbers of people (for example, Hayden, 1995, p. 280; Keeley, 1995, p. 244; Nesbitt, 2002, p. 124). This especially holds in contexts of so-called complex hunter-gatherers (Price and Brown, 1985), who may have had a very flexible—complex—settlement pattern in which periods of "sedentism" alternated with periods of mobility. In this regard, Valla argues that:

> the demographic expansion suggested cannot be sustained by the available evidence. The size of sites and their relative richness can be understood in terms of the way in which people frequented them—in terms of changing social practices, without having to rely on models which cannot be proven. Furthermore, the stability of traditions, which seems to be one of the characteristics of the period, does not suggest large-scale movement of the population. Finally, evidence from the 'peripheries' during the Natufian does not indicate that people there developed agricultural practices.
>
> (Valla, 1998a, pp. 183–184)

More generally, Price and Gebauer (1995) have noted that "Although the size of human populations ... is certainly a factor in the transition

to agriculture, population pressure does not appear to be a major force in changing subsistence strategies," and, "we regard substantial population as a condition for subsistence shifts rather than as a cause" (p. 7).

Recently, in a zooarchaeological analysis of Early and Late Natufian use of animal resources (see later), Munro (2004) has given the Younger Dryas models an elegant spin. Rather than agriculture being adopted as an immediate response to the cooling and drying of the Younger Dryas, she envisages that the Late Natufians responded to the potential environmental and food stress not by intensifying cultivation, but demographically by reducing their site-occupation density through mobility, or shrinking their populations, or both. Only later, when the extraction of wild resources had been pushed to its limits, were the Late Natufians encouraged to more intensive cereal "management," and ultimately this pre-adaptation resulted in agriculture.

The Seasonality Model

The influential seasonality model of McCorriston and Hole, published in 1991, is based on the idea that domestication was the outcome of historical accident, and not some "sweeping global process" (1991, p. 47). After pointing out that there had to be opportunity, technology, social organization and need for agriculture, they briefly and boldly answer the *when*, *where*, *how* and specifically *why* questions: *when?* according to dates the PPNA; *where?* the land surrounding the Lisan and Beisan lakes in the Jordan Valley; *how?* unconscious selection. Concerning the *why* question they focus on seasonality. Mainly basing themselves on information of the Cooperative Holocene Mapping Project (COHMAP, 1988) and pollen data, McCorriston and Hole argue that in the Early Holocene there was a climatic optimum with a clear difference in seasonality: that is, a large contrast between hot, dry summers and cold, wet winters. Apart from the drying of Pleistocene lakes, the plant cover of the Fertile Crescent changed dramatically at the beginning of the Holocene. Perennials decreased, but annual cereals advanced.

McCorriston and Hole describe the origins of agriculture in the Near East as follows:

> With increasing summer aridity and the shrinking of lakes, people faced seasonal shortages of critical resources. By responding to these shortages through storage and sedentism, people increased the pressure on local environments and began to deplete them. Rather than move, perhaps because other sedentary populations had likewise depleted nearby locations, people intensified their efforts to harvest deer, gazelle, and annual seeds. Increased seasonality, the drying of interior lake basins, the advantages of sedentism, and local depletion of essential resources are

> the reasons why people converged around the shores of Lake Beisan at the end of the Natufian period and domesticated cereals and legumes.
>
> (McCorriston and Hole, 1991, p. 59)

Thus, the following chain of events is supposed: seasonality, storage, sedentism, resource depletion, agriculture. Wright, questioning the effect of the Younger Dryas event, adopted the seasonality paradigm (Wright, 1993). Blumler (1996) also favors the model because cereals do well in seasonally dry environments, have large (nutritious) seeds, and would have been easy to cultivate. As will be discussed later, the model is also part of the path-dependent model of Benz.

The seasonality theory includes climatic change, anthropogenic environmental change (cutting trees and shrubbery, setting brush fires, trampling), technology (long-term storage, grinding and processing of seeds) and settlement organization (sedentism). However, as discussed earlier, the domestication of cereals in the PPNA, and the presumed limited chronological distance between cultivation and domestication is questionable, making the seasonality model less straightforward than it seemed to be.

The Coevolution Model

Rindos (1984) concerned himself with the coevolutionary (unintentional) relations between plants and animals, and between plants and humans during the process of domestication. He believed domestication to be the result of coevolved mutualisms between humans and plants. He distinguished three phases in this process: (1) *incidental domestication*, referring to the dispersal and protection of wild plants, in the course of time resulting in changes in some of them; (2) *specialized domestication*, indicating intensive relations between humans and plants in artificial surroundings; (3) *agricultural domestication*, denoting the outcome of the evolutionary process and resulting in domesticated plants. Domestication is then based on first, genetic mutation; the occurrence of specific pre-adapted plants (with tough rachises) and, second, anthropogenic contexts and behavior, involving the selection of mutants (plant–human symbiosis). Thus, agriculture is a late stage in the long evolution of human–plant symbiosis. Agricultural techniques transcend the environmental limitations of the human–plant interactions. Due to the domestic plants, the carrying capacity of regions could expand, resulting in population growth and subsequent expansion of agricultural societies. Moreover, a positive feedback system developed, in which domestic plants and agriculture triggered population growth, which in its turn triggered agriculture, and so on.

Rindos (1984) thus proposed a neo-Darwinian evolutionary model, stressing the unconscious selective pressures. He explicitly denied human intentionality ("recognition of the long-term effects of behavior" (p. 98)). As Watson (1995, pp. 31–32) has pointed out, his virtual denial of an active human role in the process of domestication has damaged his theory unnecessarily. It is much more likely that both intentional actions and (unintentional) coevolutionary relations interacted in complex ways in the domestication process.

Tchernov also favors slow unintentional evolution of plant and animal domestication, but he does include cultural factors: "the emergence of domesticated animals (and plants) is essentially a consequence of an evolutionary process, which appeared by chance. Intentional manipulation of animals (whether already domesticated or wild) emerged only later on, after a period of sociocultural maturation" (Tchernov, 1998, p. 34).

The Path-Dependent Model

Inspired by both the coevolutionary model and the seasonality model, Benz (2000, 2004) has presented an interesting new "ethnological" model of neolithization in the Near East. Although she calls her approach ethnological, it appears that for her the ultimate reason that people started farming was related to the environment (seasonality). Therefore, her model has been included with the environmental approaches. In her book, which contains a wealth of information about theories of the emergence of agriculture, chronology, climate development, settlement patterns, subsistence and reciprocity among (sub)recent hunter-gatherers, she introduces a "path-dependent" model. Path-dependence refers to idea that people's decisions are affected by earlier decisions: they are steered on a predetermined path. In other words, human behavior is not necessarily intentional and rational, and long-term consequences of actions can rarely be assessed.

On the basis of an extensive survey of 43 recent hunter-gatherer groups regarding changes in subsistence from procurement to production, Benz formulates a number of basic theses relevant to domestication: (1) in the case of constant and sufficient food supplies, there is an increase in birth rates, reduction of infant deaths, and consequently population growth; (2) if conflicts cannot be solved by means of migration, groups of 50–100 people need social regulation mechanisms; (3) mobile lifestyles are given up in the case of locally circumscribed food resources, but if groups become dependent on such resources, the sedentary way of life is sustained even if conflicts arise; (4) reciprocity is limited when sharing is not advantageous, for instance, due to resource competition, exchange, storage, overlarge group

size or conflicts; (5) claims to private property may evolve in the case of circumscribed, desirable or rich resources; investments in resources (such as the burning of fields) lead to use rights; borrowing of implements leads to unequal access to goods; (6) in the case of seasonal shortages, cultivation is practiced only if other options are not available; there is a clear preference for plants which are easy to grow and which have short reproductive cycles; (7) limitation of reciprocity is a precondition for agriculture, given the necessary storage of sowing seed.

Mainly basing herself on these theses and adoption of the seasonality model, Benz first argues against some traditional approaches: (1) it is unlikely that cultivation started in the Younger Dryas, given the minimal seasonal differences; (2) cultivation is also unlikely in times of resource abundance; (3) social hierarchy is not a precondition for cultivation. According to her model, people first became dependent on local resources, either due to the presence of rich, dependable and geographically circumscribed resources (cereals), or due to shrinkage of the area of indispensable resources (due to population pressure or environmental changes). In the case of rich and predictable resources, this resulted in decreased mobility, potentially leading to social conflicts. In the case of shrinking resources, competition is to be expected. Both conflicts and competition result in a reduction of the principle of reciprocity. Consequently, new means for dealing with food shortages had to be devised: specialized exchange or storage. Storage, exchange and resource claims would then lead to sedentism, in its turn leading to storage, etc. Moreover, it is expected that kinship and social relations within village communities would be intensified. Due to sedentism, storage and exchange, depending on local circumstances, shortages of resources might occur. In order to counter such situations, cultivation would be initiated. This investment in resources further reinforced sedentism, storage, cultivation, and so on. Moreover, people may have become emotionally attached to their villages and the new way of life. In time, property claims may have led to social differentiation.

In this model agriculture was based on a dependence on regionally circumscribed resources and the subsequent reduction of reciprocity. More basically, it was the unintentional outcome of the evolution of a symbiosis between plants and humans.

The Proto-Farming Model

In a small book, Tudge (1998) has dealt with the origins of farming from an explicitly evolutionary and long-term perspective. He has put forward the thesis that from at least 40,000 years ago, people had such

an impact on their environment (plant protection and propagation, game management such as the use of fire) that they should be called "proto-farmers." By the time of the Neolithic Revolution farming had then already been practiced for thousands of years: "Dramatic as they appear, then, the changes of the Neolithic Revolution were not really revolutionary, but merely a consolidation of established trends" (Tudge, 1998, p. 3). Thus, the Neolithic Revolution presents the practice of agriculture on a *large scale*. According to Tudge, the major trigger for the transition of proto-farming to large-scale farming has to be sought in the rise of the sea level at the end of the last Ice Age. As people had to crowd into smaller regions, they had to intensify cultivation, which led to domestication. With regard to the sea level changes, it is clear that Tudge is reinstating Binford's marginality model.

As he himself indicates (Tudge, 1998, p. 4), his theory is wholly hypothetical, with no evidence to substantiate the existence of proto-farmers so long ago. However, his model is interesting in that it presents a long-term, processual perspective, thereby questioning the revolutionary nature of agriculture.

Social and Anthropological Models (Culture)

The Hilly Flanks Model

While Childe located early agriculture in the low-lying oases in the Nile valley and the Levant, Braidwood (1960) argued for origins in the lower foothills and intermontane valleys of the Zagros-Taurus arc. On the basis of the Iraq-Jarmo project of the late 1940s, he expected agriculture to have evolved at the end of the last Ice Age in the region of the wild ancestors of crops, sheep, goats and cattle, resulting in village farming communities like that of Jarmo. With the help of a multidisciplinary team, he defined his "hilly flanks" theory (also termed "natural habitat" or "nuclear zone" hypothesis). Contrary to Childe's expectations, no evidence was found for Early Holocene desiccation. Therefore, he tried to explain the agricultural transition mainly as socially and culturally driven. He argued that the transition came about when "culture was ready": that is, when Epipaleolithic people had developed sufficient technological capacities (such as grinding stones and more effective weapons) and knowledge about the surrounding world, which resulted in more time spent at favorable locales. Thus, plants and animals could be monitored closely, and closer relations between people, plants and animals evolved. Stands of wild grain were harvested and people experimented with controlling animals and plants. This phase has

been termed incipient agriculture by Braidwood. In some cases, it led to farming village communities. Although it is unclear why culture was ready at that specific time, and we now know that the earliest food-producing communities were in fact located in the Levant, his approach and theory are still relevant due to his insistence on multidisciplinary research and his contention that agriculture started in the natural habitat of wild progenitors.

The Marginality Model of Flannery

Flannery (1969, 1972, 1973), working in the Deh Luran region of western Iran, adapted Binford's marginality model, but rejects climate as the prime motive for domestication. According to him, agriculture was started in response to demographic and economic changes. In the Zagros, populations started growing ca. 20,000 years ago due to the "broad spectrum revolution," leading to sedentism and population growth. People would have moved to marginal zones where they cultivated grain. Unlike many other general theories, Flannery's account pays explicit attention to biological aspects of grain domestication. He distinguishes three phases in the process towards domestication: (1) transport of wild species outside of their homelands; (2) elimination of natural selection mechanisms; (3) unintentional selection of phenotypes that would not normally survive in nature. Together, these three unconscious processes combined with simple irrigation procedures led to an irreversible process of intensifying human–plant relations that resulted in domestication.

The Population Pressure Model

Cohen (1977), largely basing himself on the work of Boserup (1965), gave pre-eminence to population pressure (treated as an independent variable) as the reason for food production in the world. The underlying notion is that human populations have an inherent tendency to grow and that they are poorly equipped to control this growth. According to him, continuous population growth and expansion through the Late Pleistocene and Early Holocene led to a "full world" at the beginning of the Holocene, in which it was no longer possible to migrate to other areas. Due to the resulting stress in food resources, people had to turn to less-preferred food, first from megafauna to small game and then to a broad spectrum of plants and animals and, ultimately (it is not explained how), agriculture. Thus, according to Cohen (1977, p. 14), population growth is the cause rather than the result of human "progress" or technological change. Of course, this is a rather

narrow stance; population growth and technological change are dialectically rather than lineally related. Moreover, Henry (1989), amongst others, has pointed out that the broad spectrum economy is not supported by the evidence from the Levant. The proposed population expansion in the Upper Pleistocene, also suggested by Binford and Flannery, is not supported by the evidence either (Hayden, 1992; Henry, 1989, pp. 20–24). Although Cohen's monocausal and global theory is nowadays largely rejected, population pressure remains an important part of many current theories.

MacNeish (1992) provided a "positive feedback process" for explaining the origins for agriculture. In his model, domestication is treated as a long-term evolution, mainly based on an evolution in subsistence practices, sedentism and, foremost, population growth and stress. In short, starting in the Natufian, the following steps are suggested (MacNeish, 1992, pp. 146–149): presence of potential domesticates/abundant resources; resource specialization; population growth; diminished carrying capacity of circumscribed locales; import of domesticates; *horticulture* (PPNA); further population growth; lower carrying capacity; more farming; *agriculture* (PPNB).

The Social Relations Model

Bender (1978) has tried to show how developing social relations may have promoted economic change and farming. Her thesis revolves around the notion of intensification, which is defined as increasing productivity (not production) per given area. Following Sahlins' (1988) Domestic Mode of Production and the alliance theory of Lévi-Strauss (1961), Bender focuses on the production relations of hunter-gatherers. Although the ideal in "typical" hunter-gatherers is "under-productivity," in order not to exceed the carrying capacity, there are many instances where there is surplus production. Most often, these are social obligations, such as marriages, ceremonial and trade alliances. In other words, there is a system of social relations with potentials for increased demand. On the basis of ethnographic parallels, she argues that it is through individuals in authority that demands for increased productivity are channeled. Via trade and the acquisition of (valuable) trade goods, an incipient hierarchy may evolve. Thus, there is a direct link between evolving social institutions and an increasing pressure on production. Due to alliances and leadership, (seasonally abundant) food is accumulated and redistributed, often with a delayed return, resulting in storage. Storage in its turn motivates sedentism, promoted and permitted by leaders. A feedback system evolves consisting of sedentism, production and storage. Population numbers will rise, promoting hierarchization. Intensification may thus result in technological innovation: that is, in cultivation.

Turning to the archaeological record of the Near East with this theory in mind, Bender suggests that the Natufians were fully tribal societies, possibly with regulated descent systems, with exchange networks, ceremonial institutions, and leaders that made increasing demands on production. In the marginal areas, this increasing demand would have triggered the shift to food production. Consequently, farming started as a response in order to be able to participate in the social networks of exchange, competition and ritual, necessitating surplus production of foodstuffs.

The Socioeconomic Competition Model

Like Bender, Hayden (1990, 1992, 1995) rejects external and environmental pressure (such as climate or population pressure). Largely basing himself on ethnographic sources, he also focuses on socioeconomic competition, specifically on competitive feasting, to explain the emergence of farming. His scenario is based on four basic variables (Hayden, 1990, pp. 58–60): (1) domestication depends on the influence of "accumulators"; (2) domestication is linked to the availability of potential local "feasting plants and animals"; (3) the choice of specific plants or animals is related to dietary and feasting desires; (4) domestication is also related to non-food species (such as bottle gourd, dog) that can be used in feasts. According to Hayden, food-production only takes place when the typical obligatory sharing of generalized hunter-gatherers was no longer essential for survival, and ownership not a taboo anymore. Such changes would only take place in contexts of reliable and abundant food resources. Given the developed Mesolithic technology (baskets, nets, bow and arrow, domesticated dogs), rich resources (such as reindeer herds) could be effectively and intensively exploited. Ambitious individuals would be able to collect considerable surpluses and organize competitive feasts in order to control labor, loyalties and loans, thus gaining power and prestige. In this scenario, the first domesticated species would have been highly desirable foods and "delicacies" which were labor-intensive to obtain. In short, cultivation and ultimately domestication would emerge in a sphere of competition and competitive feasting of complex hunter-gatherers in areas of rich resources. The first domesticates were prestige items used by accumulators to outclass their rivals.

Although Hayden's theory is innovative and important in introducing human agency, it has not found common acceptance among researchers (e.g. Keeley, 1995). The main problem with his model is that it is not substantiated by the evidence. Kuijt and Goring-Morris (2002) have recently pointed out with respect to this model that (1) before the Middle PPNB there is no good evidence for extensive food storage; (2) social

differentiation is not attested anywhere in the Natufian or Early Pre-Pottery Neolithic period; (3) likewise, there is virtually no evidence for social conflicts in these early periods. The main problems of the model, then, are of a chronological nature; if we would update the model, it seems that aspects of it may indeed be relevant for explaining agriculture. Indeed, if the "short-gestation" model for plant domestication of Nesbitt (see earlier), and the positive correlation between animal husbandry and ritual in the PPNB (see later) are accepted, socioeconomic factors like those proposed may be incorporated, although they do not necessarily relate to competition alone.

The Domestic Society Model

In his famous *The Domestication of the Human Species*, Wilson (1988) has argued that sedentism and architecture meant the creation of a built environment, which was one of the most important steps in the history of humankind. As will be clear from his definition, which was introduced earlier, Wilson's book is not about the domestication of plants or animals, but rather about the domestication of people and society, focusing on psychology and social relations. Moreover, he is not concerned with origins or processes of change. Basic to his anthropological analysis is the idea that there is a sharp distinction between so-called open societies of hunter-gatherers and the domestic society of people in villages, towns and cities. According to him, one of the main distinctions is the absence of substantial architecture in open societies. Domesticated societies, on the other hand, are marked by architecture, and concomitantly by clear boundaries, strict distinctions between public and private, and so on. The house and village act as a system of metaphors that serves as a basis for and of social structure. In other words, architecture is a material representation of abstract ideas, a "mnenomic device" and a "powerful means of symbolic communication" (Wilson, 1988, p. 76). Especially in pre-literate societies, the house is one of the best means available to encapsulate ideas. Thus, there is a dialectical relation between architecture (and material culture in general) and social behavior: "Members of domesticated societies, then, are born into and surrounded by visible, material elements that not only are themselves arranged as structures but serve as the basis of social structures. Through settlement and architecture the *principle* of pattern and structure is embodied in the atmosphere, the very environment and context of living, a situation rather different to that of the individual living in the open society" (Wilson, 1988, p. 65).

This is all true, and, today, there is a huge amount of literature in anthropology, sociology and archaeology about social space (for

example, Blier, 1987; Bourdieu, 1973; Hillier and Hanson, 1984; Kent, 1990; Parker-Pearson and Richards, 1994). Questionable, however, is Wilson's strong differentiation between societies of hunter-gatherers and domesticated societies, and especially the many dichotomies between nature–culture, mobility–sedentism, sharing–storing, openness–closedness, no social structure–social structure, equality–inequality, public–private, myth–history, etc. Furthermore, from an archaeological point of view, his neglect of origins and lack of inquiry into processes of change is unsatisfactory.

Cognitive Approaches (Culture)

Psycho-Cultural Models

In an influential book about the origins and spread of agriculture, Cauvin (2000, see also Cauvin, 1972) has presented the thesis that the Neolithic Revolution was chiefly a revolution of symbols and of the mind. He explicitly rejects environmental, demographic and cultural approaches. Basing himself mainly on structural archaeology and the *Annales* school, he argues that the origins of agriculture have to be sought solely in cognition. Geographically, he focuses on the Middle Euphrates (the "Mureybetian"), and, to a lesser extent, on the central Levant (the "Aswadian") and the southern Levant (the "Sultanian"). His narrative starts with the Natufian, which existed in a context of wild resource abundance in the Levant. Although their culture was pre-adapted for agriculture, it did not simply evolve into it: "they must have wanted to change. Such a wish could only come from the area of collective psychology" (Cauvin, 2000, p. 66). This "initiative" can be found in the Early PPNA Khiamian, when the symbolic repertoire was structurally reordered. (Cauvin thus makes a very strict separation between the Paleolithic and the Neolithic.) This cognitive change has been termed "Revolution of Symbols," and it preceded economic change. The cognitive revolution (a "transformation of the mind") refers to the occurrence of instances of symbolism (mainly figurines and bucrania) of women and wild bulls. On the basis of this and (the much later) female and bull symbolism at Çatalhöyük, he postulates a truly new religion of a female goddess with a male counterpart in the form of a bull. The goddess was not only a fertility symbol but also a genuine "mythical personality," "a universal mother." The bull, on the other hand, was, like all the rest, subordinate to the goddess. The bull was not a true partner of the goddess, but rather it may have been born of the goddess, and it represents a universal instinctive and violent brute force (Cauvin, 2000, p. 32). In short, at the start of the PPNA there was a new "religion of the woman and the bull." Based on

the ideas of Rousseau and Hegel, Cauvin (2000, p. 209) regards religion as an "alienation," as indicated by the projection of supernatural divine personalities. This alienation, then, reshaped human cognition, as it made the mind suitable and effective for increasing manipulations of the surrounding, external world. Thus, the Revolution of Symbols became a revolution in action, domestication of plants an obvious outcome of this. Likewise, the domestication of animals is almost exclusively regarded as symbolic and cognitive: "Animal domestication was above all a response to the human desire for domination over the animal kingdom" (Cauvin, 2000, p. 128).

There are some basic problems with Cauvin's thesis. As indicated by, for example, Hodder (2001) and Rollefson (2001b), an important problem with his analysis is that he offers no explanation whatsoever for important changes, be it of the mind or material change (such as the goddess–bull symbolism and the associated religious change). Secondly, his almost exclusive focus on symbolism and cognition is too one-dimensional, and as Hodder (2001, p. 110) has indicated "he goes so far in separating off this realm that there is no possibility of explanation of change." Third, many of his arguments are based on an eclectic use of "analogies" which are far removed in both space and time. Notwithstanding these critical remarks (see also Kuijt and Chesson, 2005), it should be acknowledged that Cauvin's book presents a welcome anti-dote to much environmental determinism. He was one of the first to pay explicit attention to the crucial role of symbolism in the Neolithic, as exemplified in his innovative *Religions néolithiques de Syro-Palestine* (Cauvin, 1972).

Like Cauvin, Watkins (1990, 1992) has paid considerable attention to the changes in symbolism (primarily in architecture and burial) that pre-dated changes in Neolithic subsistence, questioning the traditional notion that the Neolithic and farming were contemporaneous (see also Nesbitt, 2001). Moreover, he also rejects environmental or demographic pressure for explaining the beginning of farming. In two new contributions, Watkins (2002, 2004) builds on and extends Cauvin's Revolution of Symbols. Watkin's analysis brings together relevant new data of archaeology, cognitive and evolutionary psychology and cultural anthropology. His basic aim is to present an evolutionary view of human cognitive abilities that allows an understanding of the revolution referred to, as well as of the modern human mind. Thus, he focuses on the Neolithic, rather than on the origins of agriculture alone. Central to his thesis, like Cauvin's, is a marked difference between Epipaleolithic and Neolithic material culture and socioeconomic practices, and the point of departure is the "explosion" of remarkable, symbolically elaborated architecture at the start of the Neolithic, such as seen at Qermez Dere in north Iraq, Jerf el Ahmar in northern Syria, and Hallan Çemi and Göbekli Tepe in southeastern Anatolia. Building on

the work of anthropologists, particularly Wilson's idea of domesticated societies, Watkins argues that this early architecture brought together the social, cultural, physical and meta-physical, its design primarily being a statement of sociocultural values. This new kind of symbolic behavior is explained by cognitive and cultural co-evolution, which had reached a stage where it became possible and logical to develop new symbolic repertoires. Specific reference is made to the work of the psychologist, Donald (1991), who points out that the capacity for language as a symbolic system ("mythic culture"), having emerged with *Homo sapiens* ca. 50,000 years ago, was at the basis of an even more important transition, marked by "theoretic culture," supported by external symbolic storage. The growing size and permanence of sedentary hunter-gatherer communities would have expanded the complexity of social relations, thus encouraging symbolic storage, mainly by architecture, which, since it is often our most immediate surroundings, has the capacity of "framing" many practices and meanings. Such "visuo-symbolic" representation would have been an especially powerful means of communication in pre-literate societies. Thus, by building and using houses, concepts were framed and new worlds were constructed. The reasons for the presumed population growth–the most important cause of the new way of life—is left unexplained. Probably this is due to the highly preferential treatment of cognitive (internal) factors, and the rejection of the effects of the physical environment (Watkins, 2004, p. 16).

The archaeological evidence (see later) indicates that ritual and religion, or the supernatural, were of major importance in these Early Neolithic communities. In trying to understand this, Watkins bases himself, among other things, on recent advances in evolutionary psychology and cognitive sciences (for example, Blackmore, 1999; Dawkins, 1976), introducing *memes* and *memeplexes* into Near Eastern archaeology. Memes are units of cultural transmission, which, like genes, are transmitted from one human mind to another, last long when they are successful, and are subject to selection. Memeplexes are simply complexes of memes. It has been proposed that clusters of religious ideas are among the most powerful memeplexes. Such religious memeplexes include notions of moral behavior, especially altruism. The new sedentary communities and new social and cultural practices would have shaped and been shaped by such new codes of altruistic behavior which were mainly transmitted through ritual.

The Domus Model

In his *Domestication of Europe*, Hodder (1990), like Cauvin, interprets agriculture as a social-symbolic process. Moreover, like Wilson and

Watkins, he puts the house and household (activities) or "domus" at the forefront. In the Natufian and PPNA, the house was the motor behind the transformation of nature into culture: "the process of domestication—the control of the wild—is a metaphor and mechanism for the control of society" (Hodder, 1990, p. 12). Not only the household but also death, wild animals and wild plants were "agri-cultured" and controlled in the house.

> The domus was put centre-stage. The house was paved and painted, and later plastered and divided functionally. Death was brought in and controlled, cultured beneath the house floor. By the PPNA wild animals were being brought in and 'controlled' within the domestic unit. 'Wild' plants too were brought in and converted into a cultural product. The domus became the conceptual and practical locus for the transformation of wild into cultural.
>
> (Hodder, 1990, p. 39)

Domus and society were dialectically related in the constitution and domestication of society. With regard to agriculture, Hodder's point of departure is that it never need have happened; like Cauvin, he assumes that intentionality, "desire" and "drama" (emotions, feelings and fears) were involved. Drama, then, created the control of the wild. Furthermore, systems of delayed return for agricultural labor investment and social and economic control in general led to increasing social and economic interdependencies. Apart from social factors, climatic and environmental changes at the end of the Pleistocene are put forward as possible triggers for the agricultural transition. Thus, the gradual socio-symbolic process of "culturing nature" had reached a critical point ("culture was ready") at the closing of the Pleistocene and the interaction of this process, climate and environment led to agriculture (Hodder, 1990, p. 293). Obviously, this "conclusion" is not very helpful. However, I believe that Hodder has made a real contribution by elaborating Cauvin's thesis that the process of domestication is not only about plants and animals. According to him, typical Neolithic practices such as the building of houses and settlements, elaborate treatment of the dead, pottery production and decoration, all have to do with a transformation of nature into culture, with an expansion of cultural control and a domination of nature. Psychological, social and symbolic factors may have played crucial roles. "The domestication of plants and animals, at least in the Near East and Europe, must be placed within the context of related 'domestication' on other domains" (Hodder, 1987, p. 56). Indeed, in my own approach, I shall stress this multidimensionality, or holism, of domestication. I will, however, refrain from the strict notion of control of the wild and from nature–culture or wild–domestic dichotomies, which are quite problematic as will be shown.

In a more recent paper concerning Neolithic symbolism, Hodder (2003) has provided some further interesting thoughts on the role of agriculture in the "Neolithic Revolution." He points out that the whole world of "the domesticated" is underrepresented in Neolithic art. Rather, emphasis is placed on the wild (as, for example, in Çatalhöyük and Göbekli Tepe). In two recent contributions regarding Neolithic animal symbolism, Coqueugniot (2003) and Helmer *et al.* (2004) have also stressed that there is a marked discrepancy between that which was eaten and that which was depicted, with the symbolism mainly referring to wild and "dangerous" animals (aurochs, snakes, birds of prey, foxes, etc.). Social relations and rituals, then, seem to have centered around the wild rather than around the domesticated. This prompts the question of how important agriculture really was in the Neolithic Revolution. Hodder points out that recent evidence indicates that the process, mainly starting in the Natufian, was very slow, with different crops and animals being domesticated at different times. Moreover, there seems to have been considerable regional variability in the process. Therefore, there probably was no "revolution," but rather a slow regionally diversified process in which plants and animals were important, but not the only components. So according to Hodder the Neolithic Revolution was primarily social. Climate probably had some impact, but, "a longer term social and economic process beginning in the Upper Paleolithic led to greater sedentism, intensification, and greater social consolidation and complexity. These processes, often 'accidentally,' caused domesticated plants and animals to emerge in some areas" (Hodder, 2003, pp. 135–136).

Diffusion

It is proper to conclude this review of the traditional approaches with some words on the spread of farming from the Near East into other areas. The amount of literature on the subject is vast; here only some of the most influential and recent ideas can be presented. Although it has recently been stated that "The fragile consensus is that a complex mixture of demic expansion and cultural diffusion was responsible for the origin and spread of the Neolithic" (Colledge *et al.*, 2004, p. 35), most models seem to give undue preference to either people (nature) or ideas (culture). This difference is commonly known as that between *demic diffusion* (colonization), and *cultural diffusion*. Both classes of theories have their problems. For instance, as indicated by Vasey (1992, pp. 28–29), the greatest difficulty with traditional diffusionist theories is that they do not present plausible explanations for the acceptance of the stimulus (idea, crop, or animal). The advantages of domesticates and food production are often taken for granted.

However, it is conceivable, and there are indeed good examples, that agriculture is not always so easily adopted. In southern Scandinavia, for example, hunter-gatherers and fishers of the Mesolithic Ertebølle culture lived just north of Neolithic groups for 1300 years without adopting agriculture, despite evidence for exchange and contact (Zvelebil and Rowley-Conwy, 1986).

In this respect, Sherratt (1999) has pointed out that agricultural diffusion was foremost a social and complex process, not necessarily a "wave of advance" (see later). Like material culture, crops and livestock interacted in contexts of competition, emulation, negotiation and communication. Moreover, diffusion was probably not a simple continuous spread, but episodic and punctuated (cf. van Andel and Runnels, 1995), probably dictated by trade and prosperity, use of specific routes, political and cultural circumstances, such as the role of rulers. Zilhão (1993) has also argued for a punctuated process, combining demic and cultural diffusion in the hybrid model he proposes.

Cauvin (2000) has dealt extensively with Neolithic (PPNB) diffusion in the Levant. Basically, he argues that the PPNB first occurred in a limited geographical zone—the middle Euphrates (around Early PPNB Mureybet)—from which it spread first to southeastern Anatolia (introducing rectangular architecture, herding and the "skull cult"), and then to the southern parts of the Levant. Subsequently, in the Late PPNB and Early Pottery Neolithic there was a "great exodus" of people into dry areas and Cyprus. Cauvin rejects external explanations such as climatic or population pressure or economy for these expansions. Instead, he proposes that we look in the cognitive and psycho-cultural realm; he regards the PPNB as an inherently "conquering culture." This expansionist aspect was based on male virility (as indicated by, for example, a concern with the "bull cult," projectile points, rectangular architecture). Moreover, in its developed form, the PPNB was marked by "existential malaises," "impatience," and "material progress" (Cauvin, 2000, p. 205). The exclusive focus on the middle Euphrates and the primacy of the psycho-cultural aspect result in rather monocausal and narrow-focused reconstructions (Rollefson, 2001b). It seems much more likely that the PPNB featured a complex mosaic of regional cultural interactions, involving not only psycho-cultural dimensions but also demographic, social, economic, etc. aspects (see Byrd, 1992, who opts for acculturation between farmers and hunter-gatherers).

The famous "wave-of-advance" model of Ammerman and Cavalli-Sforza is based on the idea of a gradual process of population expansion and a different demographic profile for farmers and hunter-gatherers. The demic expansion of farmers would have been around 1 km per year from an assumed origin in Jericho. Support for the model was initially based on

archaeological, chronological and geographic distance data (Ammerman and Cavalli-Sforza, 1973), and later on a principal components analysis of gene frequencies (Ammerman and Cavalli-Sforza, 1984; Cavalli-Sforza, 1996). Renfrew adheres to this model in his farming/language dispersal hypothesis (Renfrew, 1996; Bellwood and Renfrew, 2002; Bellwood, 2004), defending the position that "farming dispersals, generally through the expansion of populations of farmers by a process of colonization or demic diffusion, are responsible for the distribution and areal extent of many of the world's language families" (Renfrew, 1996, p. 70).

Bar-Yosef (2002) has offered some ideas on how crops and humans might have spread to these areas. He tentatively places the "core area" of farming societies in the northern Levant: that is, the middle Euphrates (like Cauvin) and Balikh valley, roughly from Abu Hureyra in the south to Çayönü in the north. Clearly favoring demic diffusion, he argues that availability of weaning foods, high yields of cultivated grain and storage facilities enabled population growth. Due to this growth (or pressure) and the geographic make-up of Upper Mesopotamia, with many intermontane valleys, farmers attracted by arable lands traveled in various directions and established new communities.

Zohary and Hopf (2000) have remarked that the spread of the Near East crop assemblage (wheat, barley, lentil, pea and flax) to the west (Europe) and east (central Asia and India) was a quick process (ca. 1000 years from the Levant to Western Europe). Recently, Colledge *et al.* (2004) have considerably expanded on this view, for the first time systematically reviewing archaeobotanical evidence for the spread of farming. The preliminary multivariate analysis (correspondence analysis) of 40 aceramic Neolithic sites from southwestern Asia and southeastern Europe indicates so-called vegetational signatures, which characterize different geographical regions. On the basis of this, it is argued that, from the Levantine core, first Cyprus and then central Anatolia and Crete and Greece were colonized. Early farmers (rather than their ideas) would have moved into favorable environments, thereby largely assimilating, acculturating or replacing the suggested small populations of local hunter-gatherers.

Another innovative biological approach is presented by Pinhasi and Pluciennik (2004). Their method consists of a principal component analysis of human skeletal material, particularly craniometric data, of Early Neolithic populations from Anatolia, the Levant, southeastern Europe and the Mediterranean. They find that the earliest farming populations in the Near East differed significantly: they were marked by a considerable biological heterogeneity when compared to the more homogeneous European population. This pattern is explained by the dispersal of a "bottleneck"

population from central Anatolia, entering Europe through western Anatolia. As opposed to the archaeobotanical theory of Colledge *et al*. (2004), little biological interaction between the colonizers and local hunter-gatherers is supposed for southeastern Europe. In the western Mediterranean region, however, a different, more gradual and complex pattern of demic dispersion is suggested. In general, Pinhasi and Pluciennik point out that the Neolithic diffusion has to be treated as a series of historical events, rather than a "single demographically driven episode of gradual logistic growth" (2004, p. 74). Although they dealt solely with skeletal material, Pinhasi and Pluciennik also point out that full interpretations should include biological, social, demographic, etc. parameters.

A HOLISTIC APPROACH (NATURE/CULTURE)

Theoretical Framework

The "holistic approach" which I present here attempts to deal with the many different dimensions of domestication, integrating data from both natural and cultural sources. The approach is based on five groups of concepts, a new definition of domestication, and of course (foremost) on the work of many other researchers.

The theoretical framework consists of the following interrelated groups of concepts, which I believe to be of basic relevance for understanding domestication (Fig. 3):

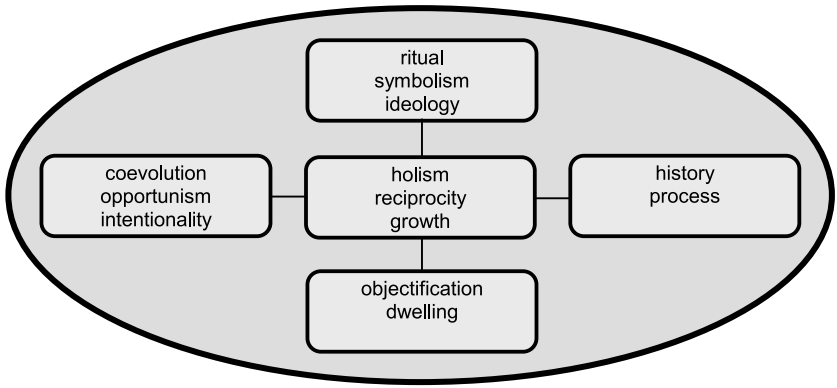


Fig. 3. The theoretical framework of the holistic approach to domestication: interrelated groups of concepts.

– holism, reciprocity and growth;
– ritual, symbolism and ideology;
– coevolution, opportunism and intentionality;
– objectification and dwelling;
– history and process.

In the following paragraphs, each of these concepts will be introduced, and on the basis of this discussion a new definition of domestication is proposed.

Holism, Reciprocity and Growth

Underlying the approaches to domestication introduced earlier is the famous nature–culture dualism. Within the environmental approaches, human behavior is regarded as consisting of adaptive responses to environmental constraints (especially climate). Nature, then, is seen as the determinant of social action (for example, Wright, 1993). In the social and especially the cognitive approaches, on the other hand, it is people who rule the world (Hodder, 1990).

However, it is now well known that the clear distinction between nature and culture is problematical (Williams, 1980). First of all, the construction and use of structural oppositions in general has been successfully criticized, especially in social anthropology. The main problem with classical structuralism is that it is mechanical and inflexible. Humans become passive subjects, slaves of abstract ordering principles (Miller, 1987, p. 103). While for analytical reasons it is often useful to isolate a number of key dimensions and distinctions, many studies have shown that such distinctions are dependent on context. For instance, depending on circumstances, the Nuaulu of Seram in eastern Indonesia consider the forest as either human or non-human, as male or female, as friendly or dangerous (Ellen, 1996).

Second, it is an anthropological fact that for many people around the world the nature–culture dichotomy or the idea of the transformation of nature is utterly meaningless. In this respect, it is instructive to pay attention to Ingold's "anthropological perspective" on domestication. Ingold sets out to dissolve the collection–production dichotomy, which is "embedded in a grand narrative of the human transcendence of nature, in which the domestication of plants and animals figures as the counterpart of the self-domestication of humanity in the process of civilization" (Ingold, 1996c, p. 12). Alternatively, in many non-Western societies, plants, humans and animals, nature and culture, are not so clearly separated; rather, each of these constituents of the environment interacts in a continuous field of relations. Indeed, it seems that for most non-Western people the idea of a transformation from nature into culture is irrelevant. This idea, and the

related claim of human superiority, is essentially a modern one (Ingold, 1996c, p. 16). Rather, in processes of *growth* humans, plants and animals are related not only economically but also (and in many contexts in the first place) symbolically, in a world that is natural and social at the same time. "we are dealing with processes of *growth*, in which human beings, animals and plants come into being, each in relation to the others, within a continuous field of relations" (Ingold, 1996c, p. 12).

For the Achuar of Amazonia, for example, most plants and animals are persons, living in societies and having social relations with people (Descola, 1994). Likewise, for the Chewong who live in the Malay rainforest animals and spirits are conscious beings with language, reason, and so on (Howell, 1996). There are many more instances of this holism or wholeness (Descola, 1996; Descola and Pálsson, 1996; Ellen and Fukui, 1996; Jordan, 2003). In fact, Descola (1994) has argued that there are "societies of nature" in which humans, plants and animals are subjected to the same rules and are part of a socio-cosmic community. Thus, in many non-Western, non-modern, "holistic societies," there are not the clear-cut subdivisions between economy, politics, religion, people, animals, spirits, and so on that are taken for granted in the Western world (Fig. 4).

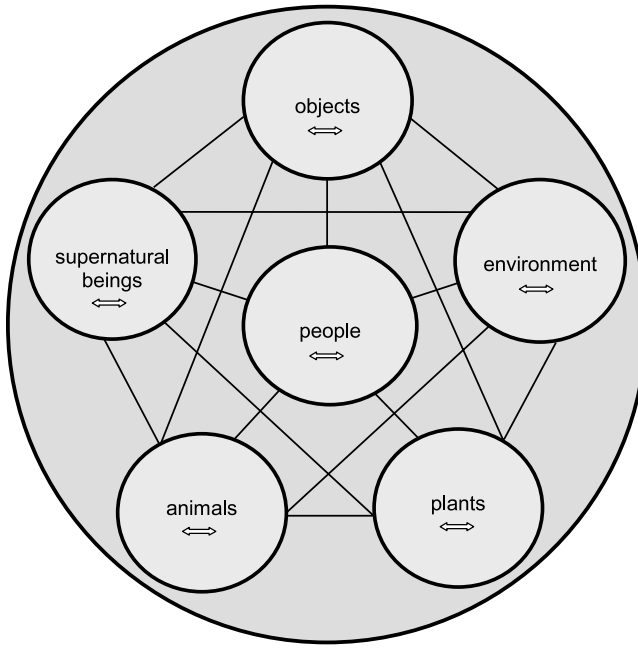


Fig. 4. A socio-cosmic universe, indicating the various dimensions of domestication and substantiated by many different (reciprocal) relations.

Third, with regard to domestication, the combined, liminal, natural and cultural status of domesticated plants and animals makes it clear that rigid separations between nature and culture do not make sense in many contexts. In fact, obviously, we ourselves are both animal and cultural (Ellen and Fukui, 1996).

These problems with the nature–culture divide do not mean that it is useless or non-existent. For many Westerners, including myself, it provides a good model for thinking about the world and other cultures. In fact, without this cognitive frame of reference, we would not be able to make sense of the surrounding world. Furthermore, I would like to point out that, while there are very large differences in many cases, a strict division between Western and non-Western thought should not be assumed *a priori*. Depending on context, divisions between nature and culture or comparable concepts (such as animality–humanity) are made in varying degrees in a number of non-Western ethnic groups (Dwyer, 1996, pp. 178–179).

Ultimately, most of the ideas about what may be termed holistic societies are derived from Marcel Mauss' thesis that the gift is a "total social phenomenon," as it involves legal, economic, moral, religious, aesthetic and other dimensions (Mauss, 1990 [1950]). This holism proposed by Mauss has been taken up by various researchers, especially Dumont and his followers, incorporating ideas about encompassment, hierarchy and holism (Dumont, 1980). Dumont has argued that societies are to be regarded as systems of ideas and values which are instantiated by relations. These ideas and values, the relations and the social and cosmological categories that define the relations are hierarchically ordered within society as a socio-cosmic whole (Figs. 4 and 5). Within these viewpoints rituals play

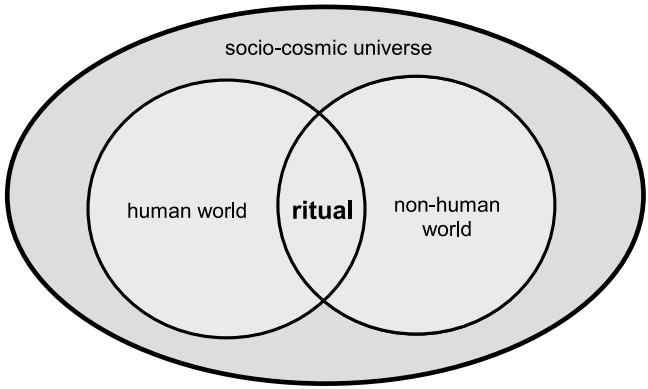


Fig. 5. Ritual as an intermediary for the establishment and manipulation of relations between human and non-human worlds.

an important part. Rituals are regarded as instances in which a movement between the different levels of the global ideological scheme is mediated, and as effectuating "a circulation of beings and things along the relations that constitute this socio-cosmic universe" (Barraud and Platenkamp, 1990, p. 117). Through that circulation, and in reference to the whole, the relations are specified and hierarchically ordered among themselves. Thus, ritual is seen as a process generative of all kinds of relations (such as among people, ancestors, deities and the dead (Barraud *et al.*, 1994; de Coppet, 1992; de Coppet and Iteanu, 1995)).

The so-called spirit-sending rituals of the Ainu may serve as an example of reciprocal (gift) relations between entities that are quite unrelated for many of us. The Ainu are the indigenous people of northern Japan (Hokkaido), who formerly also inhabited southern Sakhalin and the Kuril Islands (Fitzhugh and Dubreuil, 1999; Watanabe, 1973). They were hunter-fisher-gatherers and in Hokkaido they lived in more or less permanent settlements in areas of abundant natural resources. Many Ainu still make a distinction between the world of the gods (*Ainu kamuy*) and the world of people (*Ainu mosir*), but according to them these gods live a life similar to humans. Moreover, the gods spend time on earth, but they disguise themselves. They can appear as natural objects, such as the sun, the moon, wind and fire; as animals such as bears, foxes, owls, and as man-made objects such as boats and pots. These gods, then, make their bodies—their material forms—available to humans: timber to make houses, salmon to eat and so on. People are free to use these godly *gifts*, but they must show respect, and after having used them, they must return the spirits to the world of the gods by means of a spirit-sending ritual. There are many different sending ceremonies for animals, plants and even broken and discarded tools. The Ainu believe that these rituals are necessary to sustain life; without them the gods would not be willing to visit the earth to offer their material bodies and life would not regenerate (Akino, 1999; Ohnuki-Tierny, 1999; Utagawa, 1992). Thus, people, things and beings are engaged in many kinds of reciprocal processes. These spirit-sending rituals are not exceptional or unique: similar practices have been reported for other northern peoples, such as the Koryak of Kamchatka (Jochelson, 1975; Oshima, 2001).

Discussing the nature–culture opposition, Descola and Pálsson (1996, p. 12) write that "Going beyond dualism opens up an entirely different intellectual landscape, one in which states and substances are replaced by processes and relations." This is indeed the approach which I would like to follow here. Instead of starting out from a pre-determined nature–culture dichotomy, I shall try to describe the process of domestication as a holistic, multidimensional phenomenon involving many different entities and

environmental, social, symbolic and cognitive relations, causes and effects (Figs. 1 and 4).

Ritual, Symbolism and Ideology

Clearly, ritual has many dimensions (Verhoeven, 2002c). Here I shall obviously be concerned with what is termed a relational approach (Verhoeven, 2002c, p. 19), in which ritual is treated as the cause and the outcome of many different kinds of relations, as indicated in the holistic definition (see earlier) of ritual. I define a symbol simply as anything taking the place of something else in order to designate it. Symbols operate by association and they transmit messages. Depending on the context, almost anything can be or become a symbol: houses, temples, statues, pots, arrowheads. Obviously, many rituals are marked by an extensive use of symbols, especially of so-called dominant symbols, which are highly visual, powerful and evocative (such as Jesus on the cross).

According to the holistic/relational approach, ritual and symbolism play a crucial role in the generation and manipulation of (socio-cosmic) relations, ritual occupying an intermediate, liminal position between human and non-human worlds (Fig. 5). Therefore, explicit attention will be paid to ritual and symbolism in this paper. I believe that ritual and symbolism are in many ways crucial for the maintenance of society. Moreover, for a prehistorian, they are the best way to get an insight into the ideology (defined as worldview or the set of moral norms and values which inform social practice), and hence the socioeconomic behavior of ancient society. As domestication is regarded here as much more than just an economic process, the use of ritual and symbolism as a "peephole" into prehistoric worldviews seems relevant.

The emphasis on ritual and symbolism, and the underlying distinction between the sacred and the profane, may seem somewhat strange in the context of a holistic approach. However, there are two good reasons for this. First, I think that within the trajectory of social life certain moments are more ritual (or symbolic) than others. Life may be permeated with ritual, but special ceremonies, funerals, and such, do exist, now and undoubtedly they also did in the past. To use the well-worn concept of a continuum between two poles, between entirely sacred and entirely profane actions, activities with aspects of both can be found. Secondly, and related to this, I argue that an analysis of prehistoric ritual and ideology should *start* with distinguishing obvious ritual and (dominant) symbolic objects and deposits. Once detected and described/interpreted, these objects and deposits should be contextualized—that is, related to the other elements of

the archaeological record. In a dialectical manner, the various elements may then give meaning to each other.

Basically, the identification of ritual has been approached through the concept of *framing* (Verhoeven, 2002c). Framing has been described as the way, or performance, in which people and/or activities and/or objects are set off from others for ritual, non-domestic purposes. A difference is being made; a special moment is constructed. Framing is mainly achieved by creating a special place, a special time, and by the use of uncommon objects: a stage is set up, special clothes are worn, distinctive objects put on display. Burials are quite obvious framed and ritual contexts. For architecture, objects and deposits, framing in the archaeological record may be recognized by paying attention to some general properties which indicate "special contexts" at the site investigated (see also Renfrew and Bahn, 2004, p. 223).

Coevolution, Opportunism and Intentionality

The notions of coevolution, opportunism and intentionality present three stages in a continuum between unintentional and deliberate/determined behavior and processes. These notions seem to be useful for the analysis and understanding of domesticatory relations.

Let us start with *coevolution*. Rindos (1984) presented coevolutionary theory as determinist, selective, developmental and gradualist, resulting in 1:1 mutualisms. However, as Blumler (1996, p. 35) points out, much recent biological research has shown that nature is much more chaotic than previously assumed (the so-called non-equilibrium paradigm); coevolutionary interactions are not straightforward evolutions towards a final end stage; rather they are diffuse, complex and have varied outcomes depending on contexts. Moreover, it has been argued by Eldredge and Gould (1972) that evolution in general may be seen as a "punctuated equilibrium": long periods of continuity, interrupted by short and very intensive periods of change. I here regard coevolution as an unconscious process involving successive changes in two or more interdependent species or entities that affect their interactions. In social terms, this indicates that human action is not always rational; it is often determined by other and earlier decisions and circumstances (see later). Through time, rather irreversible interdependencies are created (see also Benz, 2000). *Opportunism* refers to the practice of taking advantage of circumstances often with little regard for the consequences. This notion refers to intentional actions, but, like coevolution, to unintentional consequences. *Intentionality*, on the other hand, signifies a determination to act in a certain way.

As will be shown later, these three notions serve to indicate that domestication was in all likelihood neither a wholly conscious (cultural) nor a completely unconscious (natural) process (see also Vasey, 1992, p. 37). Rather, various relations between people, plants, animals, objects, and so on may have evolved and changed through coevolution, opportunism and intentionality, not necessarily in that chronological order. For instance, as will be shown, Natufian and Early Neolithic people took advantage of the positive possibilities, the opportunity, that the environment offered (such as dense stands of wild grain). Through time, through a process of coevolution, this resulted in certain strong interdependencies between people, plants, animals, and objects. Intentional experiments with horticulture possibly resulted in further coevolution and ultimately in the domestication of plants. Whatever the precise chain of events, the notions of coevolution, opportunism and intentionality seem to cover the whole gamut of actions and processes relevant to domestication.

Objectification and Dwelling

It is well known that, since the Neolithic, material objects have become ever more important, resulting in the incredible amount of objects that today surround and empower us. A useful term in this respect is *objectification*, which refers to the production of physical objects (as used here, objectification does not have the Hegelian/Marxist connotation of the social relations of labor). In a sense, objectification is an externalization, materialization, abstraction and embodiment of ideas. As Miller (1987, p. 105) has noted, "every-day objects continually assert their presence as simultaneously material force and symbol." Not only do we shape; we are also shaped by material culture and the environment. With regard to this dialectical relation and the constitution of persons, I would like to use the concept of *dwelling*.

In the context of human–environmental interactions, Ingold (1996a,b, 2000) uses the notion of dwelling in order to indicate that human apprehension of the world is an active process of engagement with other beings and entities in the (built) environment: "it is through dwelling in a landscape, through the incorporation of its features into a pattern of everyday activities that it becomes home" (Ingold, 1996a, p. 116), and "Knowledge of the world is gained by moving about in it, exploring it, attending to it" (Ingold, 1996b, p. 141). Ingold explicitly rejects the common anthropological view that the environment ("nature") is approached by means of systems of mental representations and pre-existing designs, often reconstructed as structural oppositions such as nature–culture. He points out, for example, that generally

hunter-gatherers live not in two worlds, of nature and society, but in one world as integrated beings. Dwelling and cognition are dialectically related: on the basis of dwelling people become knowledgeable actors, who after certain experiences behave in certain predicted ways.

For present purposes, I shall use the two meanings of the concept of dwelling (Ingold, 1996a, 2000). First, I understand dwelling (experiencing) as constituted and constitutive of multiple sources of information and influence, including the physical environment, history, subsistence, social relations and practices and politics. Second, with regard to the prehistoric societies that are dealt with, I argue that the construction, use and perception of the built environment, in particular, is an important dimension of domestication. In the intimacy of the house, or dwelling, where the household resides and where children grow up, ideas, values and experiences are formed, negotiated and changed. In non-Western, non-literate societies especially, the house acts as an instrument of thought and metaphor, as a microcosm (Blanton, 1994; Carsten and Hugh-Jones, 1995; Parker-Pearson and Richards, 1994; Robben, 1989; Tilley, 1999; Verhoeven, 1999).

History and Process

Obviously, social behavior is inherently historical, guided by earlier decisions, circumstances, practices and—last but not least—material culture. In order to understand causes and effects, any account of domestication should be historical, focusing on long-term processes of continuity and change. The present contribution, therefore, follows the process of domestication in a coevolutionary manner, from the earliest indications of changing relations between people and their surroundings in the Kebaran to the establishment of a village-farming way of life in the Pottery Neolithic.

Domestication

In almost all definitions, domestication is treated as a one-dimensional phenomenon, dealing with either plants/animals (nature) or humans (culture). In accordance with the holistic perspective, I would like to propose a more complete definition of domestication, even including socio-cosmic relations. According to this view:

> Domestication is a long-term process of changing relations between, and increasing human manipulation, of plants, animals, the environment, objects, society and the supernatural, leading to a humanization of the world.

Several aspects of this definition need comment. First, humanization refers to adaptation to human use, and not to the attribution of human

qualities to something. Second, domestication is a *process*, humanization the (desired?) *result*. Third, people and society, animals, plants, the environment, objects and the supernatural (nature and culture) are what may be termed the constituents of domestication. Fourth, as we have seen, usually domestication is thought of as human *control*, be it over plants, animals or themselves. Other metaphors used in connection with domestication are *boundary* and *separation*. However, control seems to be a typical Western notion (see earlier), which may not be relevant to the prehistoric contexts that will be dealt with. Moreover, it is questionable if control is such a one-dimensional feature; it can also be argued that plants, animals and "things" control us, as clearly we cannot live without them (for example, Harlan, 1995, p. 240). Obviously, there is a dialectic relation at work here, considerably weakening the notion of control. Therefore, rather than using control, I would like to speak of influence and manipulation of relations, and humanization. "In this view nature is not a surface of materiality on which human history is inscribed; rather history is the process wherein both people and their environments are continually coming into being, each in relation to the other" (Ingold, 1996c, p. 23).

According to the earlier definition, the process of domestication is still in full swing. Sedentarization and agriculture were two of the most basic first steps, but it can be argued that major achievements such as the establishment of cities, writing, the Industrial Revolution, and so on, are part and parcel of our domestic, humanized world. A particularly interesting phenomenon in this respect is the experimentation with small artificial biospheres, meant to make human life (and survival?) in space possible.

THE PROCESSES OF DOMESTICATION

The Archaeological Sequence

For present purposes, I do not consider it necessary to provide the reader with detailed descriptions of the various periods. These can be found in many excellent publications (Bar-Yosef and Valla, 1991; Belfer-Cohen, 1991a; Benz, 2000; Cauvin, 2000; Goring-Morris and Belfer-Cohen, 1998; Henry, 1989, 1995; Kuijt, 2000c; Kuijt and Goring-Morris, 2002; Rollefson, 1998; Valla, 1998a, see also Aurenche *et al*., 1987). Nevertheless, some background information is needed to understand the cultural contexts. In the following, the archaeological sequence is conveniently presented as a number of tables (Tables IV–VIII), which for each period provide information about chronology, environmental and settlement pattern, selected key sites (Fig. 2), site structure and architecture, lithic industry,

Table IV. The Kebaran

Chronology	Early Kebaran: 20,000–18,000 B.P. (23,700–21,400 cal B.P.) Late Kebaran (including Nizzanan): 18,000–14,500 B.P. (21,400–17,400 cal B.P.) Geometric Kebaran (including Mushabian and Ramonian): 14,500–12,800 B.P. (17,400–15,300/14,800 cal B.P.)
Environment and settlement pattern	Extension: Euphrates-southern Sinai; Mediterranean-Saudi Arabia There is a basic dichotomy between the Mediterranean zone (Early Kebaran, Nizzanan, Geometric Kebaran) and the steppe and desert zone (Early Kebaran, Nizzanan, Geometric Kebaran, Mushabian, Ramonian): Early Kebaran: sites largely restricted to the Mediterranean vegetation zone Nizzanan: east of the Jordan, south of Dead Sea, Negev Geometric Kebaran: close to major water sources, near the coast and dispersed over the Negev, Sinai and Syro-Jordanian deserts, up to Euphrates Mushabian and Ramonian: Negev, Sinai Ramonian: for first time sites at higher elevations in Irano-Turanian zone
Selected key sites	Ein Gev, Douara, Kebara Cave, Kharaneh IV, Nahr el-Homr, Névé-David, Ohalo II, Umm el-Tlel, Yabrud III
Site structure and architecture	Distinction between highland- and lowland sites Site-size varies between less than 100 m^2 in arid areas to ca. 1000 m^2 in the coastal ranges: generally, settlement was ca. 25–50 m^2 (especially large variation in Nizzanan) Dwellings used were presumably huts or tents made of branches and/or hides, but stone structures have also been found (EK, LK, GK) Mushabian: indications for larger agglomerations
Lithic industry	Chronological diversity, but mainly microliths, e.g. microburins, microgravettes, trapeze rectangles, bladelets
Grinding/pounding tools	Earliest appearance of grinding and pounding tools, such as bowls, mortars and pestles made of basalt (Fig. 7) These artifacts were largely restricted to sites in the Mediterranean vegetation zone
Other objects	Few bone tools Shell assemblages are Mediterranean (especially prolific in Nizzanan)
Flora	Plant remains hardly known, but the waterlogged EK site Ohalo II in the sea of Galilee, dated to 19.000 B.P. (23,500–22,500 cal B.P.) yielded many wild plant remains, including wild barley Starch grain (barley, possibly wheat) on large basalt grinding slab: earliest direct evidence for human processing of wild grass seeds
Fauna	Hunting of fallow deer, gazelle and ibex
Socioeconomic organization	Hunter-gatherers with an "egalitarian" social structure
Remarks	The Terminal Ramonian is partly contemporaneous with the Early Natufian
Selected literature	Bar-Yosef and Belfer-Cohen (1989a), Bar-Yosef and Vogel (1987), Byrd (1994a), Cauvin *et al.* (1997), Garrard *et al.* (1988), Gilead (1989), Goring-Morris (1987, 1998), Goring-Morris and Belfer-Cohen (1998), Kaufman (1992), Kislev *et al.* (1992), Piperno *et al.* (2004), Wright (1991)

Table V. The Natufian

Chronology	Early Natufian: 12,800–11,500 B.P. (15,000–13,500 cal B.P.) Late Natufian: 11,500–10,600 B.P. (13,500–12,500 cal B.P.) Final Natufian 10,600–10,200 B.P. (12,500–12,000 cal B.P.)
Environment and settlement pattern	Early Natufian: Sites are found in the entire Levant, from the middle Euphrates to the Negev highlands Greatest density in northern and central Israel and northern Jordan, corresponding to the Mediterranean forest zone (coast largely abandoned) Dichotomy between large (semi-sedentary) and seasonal sites in Mediterranean zone and non-Natufian hunter-gatherers in drier areas Late and Final Natufian: No clear differentiation between "permanent" and seasonal sites The Harifian is the Final Natufian equivalent in the Negev and Sinai deserts
Selected key sites	Abu Hureyra, Ain Mallaha (Eynan), Ain Sakhri, Dederiyeh, Douara, El Kowm, El-Wad, Erq el Ahmar, Hallan Çemi, Hatoula, Hayonim cave and Terrace, Jericho, Mureybet, Nahal Oren, Nahr el-Homr, Rosh Zin, Rosh Horesha, Umm el-Tlel, Wadi Hammeh 27, Yabrud III
Site structure and architecture	Natufian sites, including caves, range from small (e.g. around 15 m^2) to large (more than 1000 m^2) Architecture is round to oval, semi-subterranean, with diameters between 7 and 15 m in Early Natufian and 5–7 m in Late Natufian, built of stones, central hearths, occasionally postholes Structures were built in small groups: "villages" (e.g. Mallaha) Use of caves (special activities) and terraces (domestic activities) in front of them Possible storage features (pits and bins) at large sites Good evidence (e.g. animal remains, the thickness of cultural deposits, the presence of substantial dwellings, storage features, large numbers of flint and stone artifacts, burials, etc.) that large Natufian sites in the Mediterranean belt were marked by extended periods of occupation
Lithic industry	Flakes, bladelets, many microliths (especially lunates) New: picks and sickle blades, many with clear sickle sheen (for wild cereals?)
Grinding/pounding tools	Common occurrence of pounding and grinding tools, e.g. mortars, pestles and mullers
Other objects	Very rich bone industry (hide-working implements, "art objects," decorative items) Shells for ornamentation "Exotic" objects, e.g. obsidian from Anatolia, shells from Red Sea indicate long-distance exchange
Flora	Broad spectrum of wild plants, including barley, rye, lentil, nuts, fruits and shrubs Harvesting of wild cereals in natural stands Domestication of cereals has not been attested Probably cultivation of grain and lentil at Abu Hureyra

Table V. Continued

	Remains of cereals, sickle elements (often polished), grinding/pounding tools, and few possible storage structures indicate structured collection, processing and storage of wild grain and other plants
Fauna	Gazelles were the main hunted species Broad spectrum of other animals: e.g. ibex, goat, waterfowl and fish
Socioeconomic organization	Natufian society was "egalitarian": they were (so-called "complex") hunters and intensive collectors who in some areas (the Mediterranean zone) lived in villages for extended periods of time
Remarks	The Late and especially Final Natufian in the Southern Levant differs in important respects from the Early Natufian. In general there is a cultural "decline," and a return to more mobile lifeways: Decline of "central" sites in Mediterranean zone (certain sites now functioned as cemeteries for mobile groups) Desert (Negev) adaptations of Harifian No clear difference between "permanent" and seasonal sites Smaller architectural units Decrease in manufacture of groundstone tools and ornaments Changes in lithic repertoire (e.g. Helwan retouch virtually disappears) Absence of burial gifts Increase in secondary and group burials Possible indications of social stress (skeletal data) Reduction in consumption of vegetal resources Different development in northern Levant: continued "sedentism" at Mureybet
Selected literature	Aurenche and Kozlowski (1999), Bar-Yosef (1982, 1998), Bar-Yosef and Valla (1991), Belfer-Cohen (1991a), Belfer-Cohen and Bar-Yosef (2000), Byrd (1989), Byrd and Monahan (1995), Cauvin (2000), Davis and Valla (1978), Garrard (1999), Gopher and Gophna (1993), Goring-Morris (1991), Goring-Morris and Belfer-Cohen (1997), Henry (1989), Lieberman (1998), Moore *et al.* (2000), Sellars (1998), Tchernov and Valla (1997), Unger-Hamilton (1991), Valla (1998a,b), Valla *et al.* (2001), Wright (1978)

grinding/pounding tools, "other objects," flora, fauna, and socioeconomic organization, followed by remarks and a number of key references. As it is crucial to the argument, information about ritual and symbolism is included in the text for each period rather than in the tables.

The period of time and the area covered are huge and the number of research projects and publications enormous. Thanks to intense research, it is now clear that there was considerable regional differentiation. However, many researchers (such as Goring-Morris and Horwitz, in press; Stordeur, 2004) agree that there were also important similarities between regions with

Table VI. The Pre-Pottery Neolithic A (PPNA)

Chronology	Southern/northern Levant: 10,200–9400 B.P. (11,700–10,500 cal B.P.)
Environment and settlement pattern	Large (2–5 ha) sites, (semi-)sedentary "villages," mainly located on the boundary between the Mediterranean and the Irano-Turanian vegetational belts (especially in or near Jordan Valley), well-watered localities with alluvial lands (for the first time tells are formed) Temporary camps near large sites Small seasonal camps in dry areas
Selected key sites	Abr, el Khiam, 'Dhra, Gesher, Gilgal, Hallan Çemi, Hatoula, Iraq ed-Dubb, Jerf el Ahmar, Jericho, Mureybet, Nahal Oren, Netiv Hagdud, Salabiyah IX
Site structure and architecture	Reminiscent of Late Natufian: Houses most often round/oval, often semi-subterranean Generally built of mud or (plano-convex) mud bricks, sometimes on stone foundations Some of the houses were subdivided into small rooms Hearths inside the houses as well in open spaces Small stone and mud-brick bins probably served for storage Large tower and accompanying wall at Jericho indicates an architectural elaboration not seen before On the basis of subsistence and investment in building and storage, it is commonly assumed that most large sites were occupied year-round, smaller sites may have been seasonal sites related to hunting and gathering In contrast to the Natufian, houses were kept clean Regional variability: Southern Levant: small dwellings Northern Levant: small dwellings around large (communal?) semi-subterranean structures (e.g. Jerf el Ahmar)
Lithic industry	Khiam arrowheads, sickle blades, small lunates, axes
Grinding/pounding tools	Grinding and pounding tools are found in large numbers, they consist of pestles, grinders and mortars
Flora	Large variety of seeds and fruits Evidence for cultivation of plants: Weeds typical for domestic grains; sickle blades Grinding/pounding implements; probable storage features Sites were located in the dry inland areas (and not the Mediterranean coastal areas), but always near alluvial fans, springs and lakes, providing fertile soils Cereals and legumes were only a part of the diet: wild fruits and seeds continued to be collected The domestication of grain in the PPNA is still a debated issue; contested are the sites of Netiv Hagdud, Gilgal, Jericho, Iraq ed-Dubb
Fauna	Gazelle was the main hunted species Broad-spectrum of other animals: equids, aurochs, wild boar, foxes, birds and reptiles
Socioeconomic organization	No evidence for social hierarchy
Remarks	The division of the PPNA in an early (Khiamian) and a late (Sultanian) phase is still debated

Table VI. Continued

	Traditionally, Tell Aswad in the Damascus basin is regarded as a PPNA site, but on the basis of recent excavations it has convincingly been argued that the so-called PPNA levels (niveau IA) are in fact Middle (perhaps Early) PPNB
	A PPNA site with indications for ritual practices might be a small tell near Tell Abr on the Syrian Euphrates, where limestone sculpture with animal depictions has been uncovered
	The main indications for domestication of grain are changes in morphology, size and toughness of rachis fragments
Selected literature	Aurenche and Kozlowski (1999), Bar-Yosef (1986), Bar-Yosef and Gopher (1997), Cauvin (2000), Colledge (2001), Goring-Morris and Belfer-Cohen (1998, 2003), Hillman and Davies (1990, 1992), Kislev (1992, 1997), Kozlowski (2002), Kuijt and Finlayson (2002), Kuijt and Goring-Morris (2002), Lechevallier and Ronen (1994), Naveh (2003), Redding and Rosenberg (1998), Ronen and Adler (2001), Ronen and Lechevallier (1999), Rosenberg and Redding (2000), Schmidt (2001, 2002, 2003), Stordeur (2000a,b, 2003a,b), Watkins (1990), Willcox (1996, 2004a), Zohary (1992)

respect to material culture, subsistence, settlement, ritual and symbolism, especially in the PPNB, hence terms like *interaction sphere* (Bar-Yosef and Belfer-Cohen, 1989b), or *koine* (Cauvin, 2000; see also Rollefson, 2004). To use a linguistic parallel: there were (material, social, symbolic, etc.) "languages" with many "dialects" (Fig. 6). PPNB skull modeling, for instance, was based on shared general concepts, on the one hand, and markedly site-specific traditions on the other (Goren *et al*., 2001). Apart from the spatial, there are also marked chronological differences in the period concerned. For example, the Early Natufian differed in important respects from the Late Natufian, and the same can be said of the PPNB. On the other hand, periods also show important similarities and developments. Thus, to use a well-worn concept, there was both continuity and change. I shall concern myself with what we may term the general overarching structures, domestication being regarded as a long-term continuing process. However, although dealing with broader cultural patterning, I have taken care not to compress cultural variability or conflate differences too much. Thus, respect is paid to chronological differences, with the geographical focus shifting according to developments of the process of domestication.

The Processes of Domestication as *Growth*

Having presented the relevant contexts of theory and data, I shall proceed to give an interpretative account of the process of domestication. Starting in the Kebaran and using the growth metaphor, I propose a sequence of *germination*, *development*, *growth*, *retreat/dormancy*, *florescence*, further

Table VII. The Pre-Pottery Neolithic B (PPNB)

Chronology	Southern/northern Levant: Early PPNB: 9500–9300?/9600–8500 B.P. (10,500–10,100?/11,000–9500 cal B.P.) Middle PPNB ("classical" PPNB): 9300–8300/9300–8500 B.P. (10,100–9250/10,100–9500 cal B.P.) Late PPNB: 8300–7900/8500–8000 B.P. (9250–8700/9500–8700 cal B.P.) Final PPNB/PPNC: 7900–7500/8000–7500 B.P. (8600–8250/8700–8250 cal B.P.)
Environment and settlement pattern	Sites have a wide distribution: from the southern Levant (mainly in Mediterranean zone) to central and southeastern Anatolia to northern Iraq The largest sites are tells, most often situated in river valleys Some of the MPPNB and LPPNB sites in the southern Levant, all dating to the Middle and Late PPNB, are very large (7–12 ha), but it is as yet not clear whether these were indeed very large settlements In addition to the large tell sites there were smaller sites (0.1–0.5 ha), located in the steppe and near the coast, they were either foraging sites of farmers, or hunter-gatherer encampments Large game drives ("desert kites") present in Syro-Arabian desert Presence of different "territories" Dynamic settlement pattern in southern Levant: PPNA sites in abandoned, possible EPPNB sites in northern part MPPNB: sites in Mediterranean zone abandoned, occupation of large sites to the east, new sites east of Jordan valley Late/Final PPNB: abandonment of many sites, possibly due to environmental deterioration and/or anthropogenic ecological degradation, but this is contested, whereas other sites were newly founded
Selected key sites	Abu Hureyra, 'Ain Ghazal, 'Ain Jammam, Assouad, Basta, Beidha, Beisamoun, Bouqras, Cafer Hüyük, Çayönü, Dja'de el Mughara, Ganj Dareh Tepe, Göbekli Tepe, Halula, Jericho, Kfar HaHoresh, Labweh, Nahal Hemar, Nevali Çori, Ras Shamra, Sabi Abyad II, Seker al-Aheimar, Tell es Sinn, Wadi Shu 'aib
Site structure and architecture	Mainly rectangular multi-roomed buildings (Fig. 12) Walls were built of stones, pisé, mud-bricks, or combinations of these Evidence for the presence of two stories Intensive use of lime- and gypsum plaster for covering pits, walls, floors, sometimes also for decorating human skulls Very small size of many of the rooms strongly suggests they were used for storage Public structures at large sites Evidence for non-residential, "ritual" architecture Curvilinear dwellings in arid zones
Lithic industry	Bi-polar cores "naviform" in shape, pressure-flaked pieces, tanged arrowheads (e.g. Byblos, Amuq and Jericho points), sickle blades, scrapers, borers, notched pieces, burins, etc. Obsidian blades and bladelets (imported from Anatolia) are commonly found

Table VII. Continued

Grinding/pounding tools	Grinding slabs, pestles, mortars, grinders, etc., are very common
Other objects	Profusion of material culture: stone vessels, palettes, spindle whorls, tokens (small geometric objects which most likely acted as counting devices), awls, spatula's, beads, pendants, labrets, etc.
	Small vessels of unbaked clay at some sites (e.g. Assouad) and of fired pottery ('Ain Ghazal) attest to early experiments in pottery manufacture
	"White Ware" (a mixture of ashes and plaster)
	Bitumen (natural asphalt) for hafting sickle blades, the covering of baskets, or rarely, for decorating human skulls (Nahal Hemar Cave)
Flora	First secure evidence (in EPPNB) for domestication of cereals
	Still very common use of wild plants
Fauna	First evidence for domestic ungulates (first goat and sheep, later pigs and cattle)
Socioeconomic organization	Hunting decreases in importance
	No convincing evidence for clear social hierarchy
	Besides farmers, it is clear that hunter-gatherers still roamed the landscape
	Indications for pastoral nomadism in Late/Final PPNB/PPNC
Remarks	Clear connections between southern Levant, northern Levant and southeast Anatolia (e.g. exchange, material culture, ritual)
	The presence of an Early PPNB—and to a lesser extent the PPNC—phase in the southern and central Levant remains an issue of debate
	The circular/oval groundplan in the PPNB is largely restricted to the small desert sites
	Late/Final PPNB/PPNC: many of the "classic" elements (e.g. skull manipulation, lime-plaster production, etc.) begin to disappear
Selected literature	Aurenche and Kozlowski (1999), Banning (1998), Belfer-Cohen and Goring Morris (2003), Betts (1989), Bienert (2001), Byrd (1994b), Byrd and Banning (1988), Cauvin (2000), Cauvin and Cauvin (1993), de Contenson (1992), Gebel *et al.* (1997), Guilaine and Le Brun (2003), Hole (2000), Kirkbride (1966), Köhler-Rollefson (1992), Kuijt (2000a,b,c), Kuijt and Goring-Morris (2002), Moore *et al.* (2000), Nishiaki (2000), Nissen *et al.* (1992), Özdoğan (2002), Özdoğan and Başgelen (1999), Peltenburg and Wasse (2004), Rollefson (1998, 2001a), Schmandt-Besserat (1992), Schmidt (2001, 2002, 2003), Simmons *et al.* (2001), Verhoeven (2002a)

development and *dispersal*. The discussion is based on interrelated, theoretical notions given earlier, and it is organized according to the periods that have been introduced. For each period, (1) subsistence and material culture, (2) ritual and symbolism, and (3) holistic relations are discussed; these three classes are felt best to represent the constituents of domestication. As the environmental, biological and social aspects of domestication have already been extensively dealt with by many authors, my focus will be on symbolical and ritual aspects. These, as will be shown, seem to be

Table VIII. The Pottery (or Late) Neolithic

Chronology	Southern/northern Levant 7500–6650/8050–6450 B.P. (8250–7500/8700–7300 cal B.P.)
Environment and settlement pattern	Sites mainly consist of tells located in valleys Probably small temporary occupations rather than large permanent villages, were the rule in the Pottery Neolithic Instead of long-term sedentism mobility (pastoralism) seems to have dominated life in this period
Selected key sites	'Ain el-Kerkh, Bouqras, Çatalhöyük, Kaskashok, Kösk Höyük, Nahal Qana, Sabi Abyad I, Tuleilat el-Ghassul, Saidiyeh, Shaar Hagolan, Wadi Rabah
Site structure and architecture	Architecture mainly rectangular and multi-roomed, but there are also circular buildings: tholoi
Lithic industry	"Common" types such as scrapers, borers, burins, retouched flakes and blades, etc., arrowheads are found only occasionally
Grinding/pounding tools	Grinding slabs, pestles, mortars, grinders, etc., are very common
Other objects	Artifacts such as bone awls, spindle whorls, items of personal adornment, etc. are very common Introduction of pottery: coarse undecorated ware in Early Pottery Neolithic, fine painted ware in Late Pottery Neolithic (Fig. 13) Different pottery styles and "cultures," e.g. Hassuna, Samarra and Halaf in northern Mesopotamia; Yarmukian, Jericho IX (Lodian) and Wadi Rabah in the southern Levant
Flora and Fauna	A mixed economy of farming and herding (including pastoralism) of domestic species now well established
Socioeconomic organization	No convincing evidence for clear social hierarchy Besides farmers, there were hunter-gatherers and pastoral nomads
Selected literature	Akkermans (1996), Akkermans *et al.* (1983), Akkermans and Schwartz (2003), Banning (1998), Bernbeck *et al.* (2003), Carter *et al.* (2003), Garfinkel (1999), Gopher (1998), Iwasaki and Tsuneki (2003), Kafafi (1998), Moore (1985), Molist (1996), Verhoeven (1999, 2002b), Whittle (1996)

indicative of traditionally unexpected holistic relations, which, according to the holistic approach, were part and parcel of domestication. The account is in general terms, intended to indicate broad regional and chronological patterning, rather than specific local practices. Moreover, this paper is preliminary in nature, intended as a first survey of the relations between the constituents of domestication, rather than as a complete account or theory.

Germination (Kebaran)

Subsistence and Material Culture

As discussed earlier, Tudge (1998) has argued that as early as 40,000 years ago people managed their environment to such an extent that

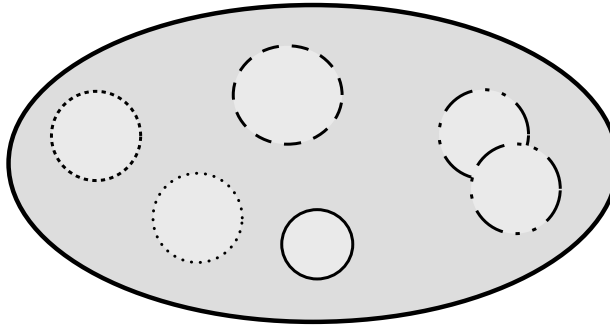


Fig. 6. Early prehistoric "cultures" in the Levant: "languages" with many "dialects."

they may be called "proto-farmers." A number of scholars have pointed out that there is as yet no good evidence for such a view. However, Tudge is probably correct in arguing that prehistoric hunter-gatherers, like recent and subrecent groups, manipulated their environment in various ways in order to increase food supplies. Thus, agriculture was not a sudden event, but the outcome of a long-term process of people–plant–animal relations (co-evolution). Although the evidence is scanty, I would like to argue that from ca. 20,000 years ago, in the Kebaran, there is evidence, not of proto-farming, but of changing relations between people, plants, ancestors and dwellings. In other words, in this period domestication may have germinated.

Kebaran dwellings were presumably huts or tents made of branches or hides. Especially interesting is the waterlogged site of Ohalo II in the sea of Galilee, where preservation was exceptional. The site covers an area of approximately 2000 m^2. Excavations have revealed a camp of six circular brush-huts, hearths, a simple stone-lined and paved oven and a human burial.

Kebaran plant remains are barely known, but Ohalo II yielded many wild plant remains (more than 30 species), including wild barley and wheat. This rich bio-archaeological evidence suggests multi-seasonal occupation (Kislev *et al*., 1992). Most recently, Piperno *et al*. (2004) have reported the recovery of starch grain (including barley and possibly wheat) on a large basalt grinding slab that was found on the floor of a hut, surrounded by plant seeds. They suggest that dough made from grain-flour was baked in a simple oven-like hearth at the site. To date, these results from Ohalo II represent the earliest direct evidence for human processing of grass seeds. Obviously, for the Kebaran people, wild grains were just a small part of their diet. The collection and processing of wild grains were conscious processes, but they probably did not have anything to do with cultivation: it was opportunistic.

The relatively large and heavy stone (basalt) grinding/pounding tools (Fig. 7) represent a new addition to the hunting-gathering toolkit. Obviously, these objects are not suited for regular transportation. Australian aborigines, for example, used to leave heavy utensils like grinding stones and mortars near the main food-gathering places to which they returned each season (Sigaut, 1996, p. 424). It may be suggested that in the Kebaran

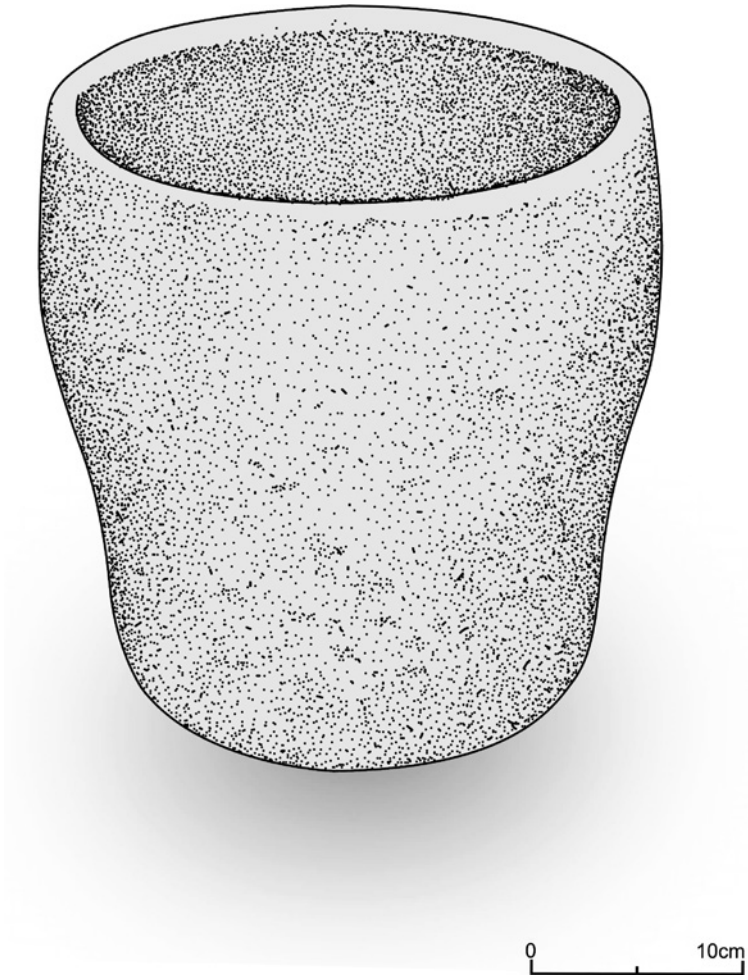


Fig. 7. Deep basalt mortar from Kebaran Ein Gev I near the Sea of Galilee in Israel. Most likely this heavy artifact was used for the processing of plants. After Bar-Yosef (1970). Redrawn from Bar-Yosef and Belfer-Cohen (1989a, Fig. 6, No. 12).

such heavy tools were stored at certain sites (base camps) in anticipation of future use. Indeed, one of the sites with pounding/grinding tools, Ein Gev I, showed repeated occupations, resulting in thick archaeological deposits. In a very direct way, such heavy tools may indeed have symbolized fixity and an attachment to place.

Thus, it seems that a number of characteristics which were to become crucial in the process of domestication in the Natufian and later periods were already present in the Kebaran:

- there was a concept of sites as fixed points in the landscape;
- stands of wild grains were exploited;
- heavy stone processing tools were used;
- bread may have been baked in simple ovens;
- some burials were located in living areas.

Ritual and Symbolism

Apart from the burial at Ohalo II, a few other Kebaran human burials have been found, such as a semi-flexed single burial of a young women in a living area in Ein Gev I; two semi-flexed burials in Kharaneh IV and burnt bones in Kebara Cave Layer C. At Névé-David, three mortars were found in a male burial: one of the mortars covered the skull, another lay between the legs (Kaufman and Ronen, 1987). The burial in Ein Gev I was spatially related to pestles, a mortar, and a hearth (Goring-Morris and Belfer-Cohen, 2003, Fig. 3). Recently Nadel (cited in Belfer-Cohen and Goring-Morris, 2003, p. 143) has presented a number of symbolic configurations at Ohalo II, including worked stones (possibly a depiction of a human figure), large blades, polished bone points, gazelle horncores, and mandibles of gazelle and fallow deer. These examples seem to indicate that symbolism, and hence probably ritual, was an integral element of at least some Kebaran sites.

Holistic Relations

On the basis of the earlier discussion, it seems that there are a number of indications for the manipulation of relations between quite different entities in Kebaran ritual and symbolism, adding an ideological dimension to the noted economic facets of domestication:

- the association of a male burial and three mortars at Névé-David clearly indicates a symbolic linking of people and plant processing tools or plants;

– likewise, the female burial found in Ein Gev I was associated with three gazelle horncores, pointing to symbolic human–animal relations;
– more generally, the burial of Ein Gev I may be indicative of symbolic relations between human life (hut and hearth), death/ancestors (burial), and possibly plant-processing (pestles and mortar).

Finally, regarding human–animal relations I would like to point out that in general, hunter-gatherers do not make sharp distinctions between themselves and animals, and animals can transform into people and *vice versa*. The discussion of Ainu environmental interactions is recalled here. As Ingold, discussing relations between hunter-gatherers and their prey put it: "Hunting itself comes to be regarded not as a technical manipulation of the natural world but as a kind of interpersonal dialogue, integral to the total process of social life wherein both human and animal persons are constituted" (1996b, p. 131; see also Bird-David, 1992). Of course, this can never be proved for the Kebaran context, but given the symbolic aspects noted earlier, it would not be too surprising.

Development (Early Natufian)

Subsistence and Material Culture

I believe that, building on certain Kebaran traditions, it is in the Early Natufian in the Mediterranean zone that the process of domestication (according to my definition) really started and developed. Indeed, the dog was the very first domesticate in the Natufian.

The Early Natufian was marked by the expansion of the Mediterranean zone during the warm and wet climate of the Bölling-Alleröd interstadial. Due to favorable ecological circumstances, there was an abundance and a broad spectrum of resources, which the Natufians exploited. Their diet consisted of various wild species, mainly gazelle (*Gazella gazella*), but also small animals, aquatic sources, fowl, nuts, grain, and so on. The rich resources, particularly the dense stands of wild grain, nuts and the essentially sedentary gazelle (Bar-Yosef and Belfer-Cohen, 1989a, pp. 450–451), and their material culture repertoire made it possible to live in villages in the Mediterranean zone for extended periods throughout the year. "It was the combined influence of broadening habitats and the availability of technologies facilitating the extraction of spatially concentrated but previously untapped resources that greatly increased the carrying capacity of the region" (Munro, 2004, p. 20). As Henry (1989, p. 35) has noted in greater detail, sedentism was encouraged by three major factors: (1) the possibility

of exploiting resources from a settlement base for extended periods of time; (2) bulk products, necessitating processing and storage facilities; (3) the importance of monitoring food sources during growth cycles.

This "settling down" was probably opportunistic behavior in the first place, motivated by resource abundance. This is not to say that the environment was deterministic; people were "pulled" rather than "pushed" (cf. Henry, 1989) to resources. Moreover, sedentism has its advantages. As Hayden (1995, p. 279) has put it:

> large segments of, if not entire, hunter-gatherer communities view camp moves as onerous work that should be avoided if possible. The aged, the infirm, the women who must carry infants and the bulk of family possessions and set up new camps, the young children, and the less energetic hunters would all view sedentism as highly desirable if resources could be assured from a more permanent base.

He also points out that even if sedentism is adopted by most community members, this does not mean that long-distance visiting, hunting, or other trips are not carried out anymore (see also Lee, 1968).

In this regard, it is important to realize that there are different degrees of sedentism. There is a continuum from fully mobile to fully sedentary societies (full-scale sedentism referring to populations which live in settlements throughout the year). It is questionable whether prehistoric societies were ever fully sedentary. In fact, there is much evidence for rather flexible systems combining mobile and "sedentary" lifeways, such as settlement systems of villages/hamlets, task camps and hunting camps, or (later) pastoral nomadism. The term "semi-sedentism," therefore, seems to be more appropriate in many instances (see also Hardy-Smith and Edwards, 2004, pp. 257–259).

On the basis of the earlier discussion, it is proper to regard the Natufian in the Mediterranean area as an "affluent society" (Sahlins, 1988, pp. 1–39). This notion refers to communities that, due to abundant, stable and predictable resources, which reduced risk and uncertainty, were able to live in villages year-round. Well-known examples of such societies are the Northwest Coast Indians of North America and the Ainu hunter-gatherers in northern Japan (and most likely their predecessors of the Jomon culture). This notion of affluence is admittedly ecologically deterministic in the sense that it is "nature" that motivated people to settle down and intensively collect (and perhaps cultivate) some species of plants. However, in the present approach there is no ecological pressure, or stress; rather, nature provided the opportunity.

The domestication of dogs, probably kept as pets, hunting companions and guards, must have made people aware of the advantages and potential controllability of non-human entities. Indeed, it is clear that in the Natufian the relations between people, plants, animals, material objects,

and ancestors changed in the sense that they became more intensified (*domesticated*) and were given clear material and spatial expression. There are various lines of evidence for this view, indicated by ritual and symbolic behavior.

Ritual and Symbolism

From the Natufian there are few indications for the special, possibly ritual, use of specific buildings. At Mallaha in the Levant, for instance, structure 131 stands out because of its large size and Valla (1991) has argued that it was purposely situated on clusters of previous burials.

Natufian burials were present in and between houses. According to Bar-Yosef and Meadow (1995, p. 56), graves at Hayonim Cave and Mallaha were dug in deserted dwellings and outside houses and not under floors. However, Valla (1998a, p. 176) notes that the systematic superimposition of houses above burials in the early phases of Mallaha suggests that the dead were sometimes buried under house floors. Also at El-Wad and Wadi Hammeh 27, there were clear spatial associations between (group) burials and residential structures (Edwards, 1991; Goring-Morris, 1995). Burials, then, were closely associated with the village and its people. Burials consisted of simple pits, occasionally paved with stones or lime-coated. There is a large variety of mortuary practices: burials are primary or secondary, single or multiple, and body position ranges from extended to flexed or semi-flexed. Some burials contain burial gifts, others do not, and no association between age, sex and such gifts has been noted (Kuijt, 1996). In Early Natufian Mallaha, various special, ritual contexts were present on floor surfaces: (1) an isolated human skull near a hearth; (2) an apparently deliberately cut-off human skull cap; spatially associated with this cap were fragments of a sculpted stone and a collection of small stones of various colors; (3) a human–dog–gazelle association (Valla, 1998a, p. 187). Moreover, gazelle horncores were attached to human skulls (Perrot and Ladiray, 1988). Perhaps even more remarkable is the burial of humans and domesticated dogs at Mallaha and Hayonim Terrace (Davis and Valla, 1978; Valla, 1998a). Other animal remains found in Natufian burials consist of gazelle horncores, teeth of horse, fox and hyena, boar tusks, and tortoise carapaces (Belfer-Cohen, 1991b, p. 580; Valla, 1998a, p. 176).

Figurines were made of limestone and bone, and mainly represent ungulates (gazelle, aurochs?). The decorated sickle hafts from El-Wad and Kebara Cave are well known and seem to depict young ungulates (Fig. 8). Human representations are rare, but include a long bone with a human head at one end and an animal (bovine?) head on the other end from Nahel Oren (Noy, 1991, Fig. 5, No. 1); a limestone figurine of a mating couple

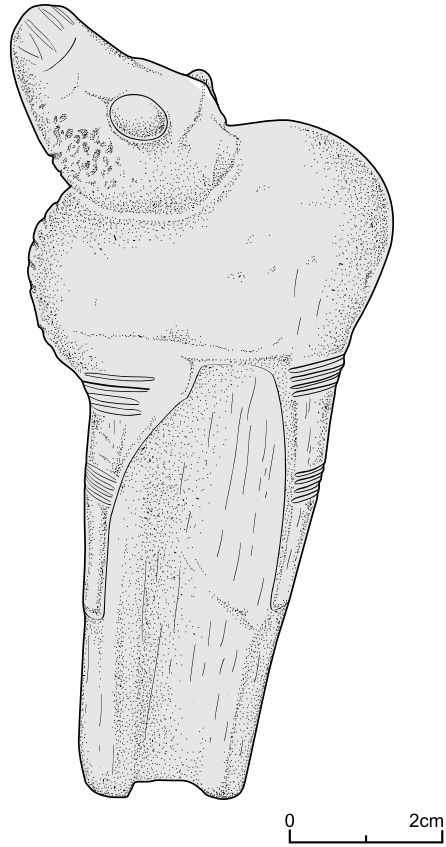


Fig. 8. Decorated bone sickle haft from Natufian El-Wad, near the Mediterranean coast in northern Israel. A young ungulate seems to be depicted, the upwards tilted-head may indicate suckling. After Garrod (1930). Redrawn from O'Neill and Howard (1986, Fig. 14).

from Wadi Khareitoun ('Ain Sakhri: Boyd and Cook, 1993); a human head of stone from El-Wad (Bar-Yosef, 1982, Fig. 8, No. 2); a stone torso from Mallaha (Perrot, 1966, Fig. 23.1), and a clay torso from Hayonim Terrace (Boyd and Cook, 1993). Stone pestles occasionally show a phallus or an animal hoof (Belfer-Cohen, 1991b, Fig. 7). Abstract patterns such as dots, nets, chevrons and lines are present on bone and stone objects (for example, Bar-Yosef, 1997, Fig. 6). For instance, at Hayonim Cave (layer B), Belfer-Cohen (1991b) has noted many different items with geometric patterns: bone tools

with holes, net patterns and grooves, limestone fragments with net-like patterns, and incised stone slabs. Ochre-stained pestles were found in graves.

Holistic Relations

It seems that there are a number of good indications for the existence of various holistic relations in the Early Natufian. First, the burial record shows that dead people were associated with the houses and the settlement. In a very real way, the ancestors were thus ever-present in the early villages. The living and the dead were not separated, as in our society, but spatially and undoubtedly symbolically and cognitively related. On the basis of this, I suggest a set of links house–death–hearth–life. The sporadic manipulation of human skulls in living areas lends support to this view. Ancestor worship probably had many dimensions; reaffirming and legitimizing household and family claims on segments of the landscape may have been one of them.

Second, in quite a number of burials there are clear associations between humans and animals. Dogs were found buried together with humans in Mallaha and Hayonim Terrace. Furthermore, various animal remains (gazelle horncores, teeth of horse, fox and hyena, boar tusks, tortoise carapaces) are regularly found in human burials.

Third, there are indications for the symbolical linking of plants, animals and people. Here I refer to the associations of human–dog–gazelle, gazelle horncores–human skulls, and fox mandible–human skull at Mallaha. Moreover, the decorated bone sickle-hafts, used for the harvesting of wild stands of plants (probably grain) should be mentioned. One of these hafts is therianthropic (half human, half animal), showing both a human and a bovid's head. Sickle hafts with animal representations (gazelle or bull) may symbolize plant–animal relations (Fig. 8).

Fourth, as indicated by Boyd and Cook (1993), the famous 'Ain Sakhri figurine of a mating couple does not only indicate a male and a female in sexual intercourse: the figurine as a whole seems to represent a penis (Boyd and Cook, 1993, Fig. 1). Thus, again, we see a quite complex symbolic linkage of different (but closely related) categories.

Finally, and more generally, the Natufians lived in the world's very first villages and they were surrounded by many different material objects and features, some of them fixed, large and very much present. Apart from the obvious lithic tools (including many sickle blades), there were houses, pits, bins, burials, ground-stone tools, bone implements, items of personal adornment, some figurines, and so forth. Their immediate surroundings were more material than any before them: objectification took

a firm hold in the Natufian. Many of the dwellings have symbolic or ritual components, such as the various associations between humans, animals, and in some instances colored pebbles, red painted wall plaster in a dwelling at Mallaha, and the geometrically incised monoliths at Wadi Hammeh 27 (Edwards, 1991). Moreover, the caves (with "domestic" terraces in front of them) provided places for special activities such as burials, crafts, caching of special objects (Goring-Morris and Belfer-Cohen, 2003).

Interestingly, a pattern appears which seems to be contradictory at first sight: on the one hand there is evidence for holism (many relations between many entities), but on the other hand there is also evidence for segregation (different dwellings, spatial demarcation of deposits and activities, profusion of different objects). In fact, this is perhaps not as contradictory as it seems. In the Natufian there seems to have been a world which was holistic with regard to relations, but bounded and segregated with regard to the *manipulation* of these relations. These reciprocal relations seem to have been manipulated (domesticated) by means of the symbolic use of material culture, (dead) people, (dead) animals, and plants.

Hodder (1990) and Cauvin (2000) have argued that the control of the wild was a metaphor and mechanism of the control of society. This thesis is based on a rather strict nature–culture duality. As indicated earlier, such a dichotomy appears to be problematical on anthropological and theoretical grounds. In the Natufian there appear to have been many relations between nature and culture, instead of strict divisions. It therefore seems that people were actively negotiating, manipulating and trying to influence (not necessarily controlling) relations between humans, plants, animals and ancestors.

The settlement, especially the dwelling or *domus* (Hodder, 1990), was of crucial importance for the creation and recreation and the maintenance of these relations. The village may have acted as a microcosm, where different "worlds" (of people, ancestors, animals, plants and objects) were condensed, symbolized, perceived (by *dwelling*), manipulated and changed in the village. This "web of materiality" opened up a "web of immateriality" and *vice versa*. In a dialectical manner, society and cosmos were given shape and changed. In the Natufian there was a marked domestication of *things*: through village life an extended material expression, objectification, became possible. In fact, it was a logical consequence of the ideology of domestication; that is, the creation of durable relations and a sense of place and tradition. Space was bounded and time was demarcated (such as by means of burials in the village). As Wilson (1988, p. 63), put it, when discussing sedentarization (*domestic society*): "But when they settle, time passes through place, place receives time, and the two merge."

Retreat/Dormancy (Late Natufian–Final Natufian)

As indicated in Table V, the Late and especially the Final Natufian in the southern Levant differed in important respects from the Early Natufian. There are still clear examples of the manipulation of human skulls, such as skull removal at Hayonim Cave and Nahal Oren (Belfer-Cohen, 1989a,b; Valla, 1998a, p. 176), and in the Middle Euphrates area (Abu Hureyra, Mureybet) occupation continued. However, it seems that in general there was a cultural decline and a return to more mobile lifeways, as in the Harifian in the Negev and Sinai. Many sites in the Mediterranean zone were largely deserted, with perhaps the Mount Carmel area, with Nahel Oren, as the only region with continuity. With regard to symbolic expressions there was, among other things, a decrease in the manufacture of ornaments, absence of burial gifts, and an increase in secondary and group burials.

It is likely that these social and economic changes were due to both natural and cultural factors. Starting with the latter, I specifically refer to the effects of Natufian (semi-)sedentism: "A prolonged occupation of a site by a group of people will cause an enormous drain on the vicinity areas, which ultimately will turn it into a barren land" (Tchernov 1998, p. 27). The best-known example of possible prehistoric overexploitation in the Levant is PPNC 'Ain Ghazal. It has been suggested that due to prolonged sedentism the landscape surrounding the site was degraded, for instance by felling too many trees for lime-plaster production, resulting in site abandonment and pastoralism (Köhler-Rollefson, 1988; Köhler-Rollefson and Rollefson, 1990). With regard to the Natufian, Valla (1998a, p. 183) has asked, "after almost two millennia of human exploitation, was the environment around the traditional sites exhausted? Was the social network unable to maintain the cohesion of the group for some unknown reasons?"

It is well known that gazelles (*Gazella gazella*) were of primary importance to Natufian subsistence; indeed, the Natufian has often been called a "gazelle culture." Cope (1991) has argued that the Natufians practiced sophisticated hunting techniques, such as drives, particularly exploiting male gazelles. This preference of males perhaps indicates that females were perceived as a stable production base, while expendable males were culled (Cope, 1991, p. 351). Ultimately, this selective culling seems to have caused a degeneration of the species, mainly resulting in extreme size variability. It is quite conceivable, therefore, that the gazelle population came under serious stress. "The impact of heavy hunting pressure and biased culling of males drove the gazelle population into such a critical situation that part of the population underwent severe dwarfism" (Tchernov, 1991, p. 330–333, see also Davis, 1991). Recently, Munro (2004) has addressed Natufian economic and demographic strategies by means of analysis of archaeofaunal

assemblages from Natufian sites in the Mediterranean zone of northern Israel (Hayonim Cave and Terrace, El-Wad and Hilazon Tachtit Cave). One of her main conclusions is that although they did not entirely deplete ungulate resources, the Natufians exerted sufficient pressure to reduce gazelle numbers. Indeed, with the onset of the Younger Dryas and the resulting reduction of the carrying capacity of the region in the Late Natufian (such as the contraction of the Mediterranean forest zone), people had to reduce site-occupation density and return to more mobile ways of life. Perhaps this was coupled with the shrinkage of resources of nuts and cereals, as suggested by Henry (1989, p. 47).

Apart from marked (negative) effects on the natural surroundings, Natufian sedentism resulted in previously unknown large amounts of garbage. Hardy-Smith and Edwards (2004) have pointed out that (in our view) the Natufians lacked systematic practices of refuse disposal. At most sites, refuse was allowed to accumulate on house floors, as evidenced by enormous quantities of waste. Overlapping piles indicate a "multi-faceted residential schedule" (rather than perennial occupation). This primary refuse mainly derived from food processing, consumption and artifact manufacture. It seems that elementary efforts at refuse disposal began in the PPNA, intensifying further in later periods. It is conceivable that the rather filthy Natufian huts made people susceptible to previously unknown diseases, as recently suggested by Belfer-Cohen and Goring-Morris (2003, p. 146). In particular, settlements that were used over long time periods may have become infested with disease. The particularly vivid description of Early Neolithic village life of Akkermans and Schwartz (2003, p. 78) may be of relevance here.

> Whereas mobile groups may decide to leave when their settlements become too filthy, sedentary populations tend to accumulate human and animal waste. The refuse would have attracted vermin, as well as the diseases they carried with them. Flies and mosquitoes transmit fecal-oral infections and other illnesses; rats bring hemorrhagic fevers; wild dogs and other carnivores carry rabies; and wild cats bring toxoplasmosis.

Perhaps the reduction in the difference in male and female stature between the Early and Late Natufian (Belfer-Cohen *et al*., 1991) is a sign of such illnesses. However, in general there is no indication of serious stress.

The combined effects of the deteriorating climate of the Younger Dryas, hunting pressure on gazelle populations, the lack of hygiene and resultant diseases thus may have been important triggers for the abandonment of many Natufian sites and the general "decline" of previous lifeways, at least in the Mediterranean zone. I do not think that the Natufian was an inherently unstable society (cf. Bar-Yosef, 2002; Henry, 1989), given their long—almost two millennia—history, but in the end their prolonged fixed

habitation and pressure on the landscape and its constituents may have made them vulnerable, the quite sudden Younger Dryas having been the trigger for the abandonment of sites and regions.

In conclusion, the process of domestication seems to have been interrupted to a considerable degree in the Late and Final Natufian. To be sure, life continued in some selected areas in the traditional Mediterranean homelands and the Middle Euphrates region, but in surrounding areas (mainly the deserts) people seem to have returned to a "less domestic" mode of life. However, in these areas, too, the presence of, for example, dwellings, storage structures, mortars, pestles and grinding stones, and a (symbolic?) monolith at Rosh Zin indicate that many domestic features were still maintained. Moreover, as Grosman (2003) has recently argued, although there were clear changes in settlement and subsistence, traditional ritual customs, especially burial, continued, for example at Hayonim Cave and Hilazon Tachtit Cave in the Mediterranean zone. He proposes that ritual played a role in the unification of mobile groups. Thus, group identity was maintained in a period of instability. Although their culture had undoubtedly changed in important ways, Late and Final Natufians certainly carried within them the seeds of domestication.

Growth (PPNA)

Subsistence and Material Culture

After the Younger Dryas, the Early Holocene PPNA period saw a rapid return to wetter conditions and the growth of alluvial fans, springs and lakes, which became the loci for settlement. These favorable natural circumstances (that is, this opportunity) seem to have resulted in the re-establishment of many earlier, Natufian traditions (e.g. Goring-Morris and Belfer-Cohen, 2002; Kuijt and Goring-Morris, 2002, p. 420). Figuratively speaking, the dormant seeds of domestication came to growth again. As indicated in Table VI, this is especially the case with regard to architecture (round, often semi-subterranean, stone houses) and burial (related to house, no grave-goods, manipulation of human skulls). Indeed, the symbolic elaboration of the house (see later) seems to indicate its increasing social importance. However, there were clear differences as well. For instance, the large tower and accompanying wall at Jericho show an architectural elaboration not seen before. Also, in contrast to the Natufian, sites were now centralized in and around the Jordan Valley.

As its name indicates, the PPNA is traditionally regarded as the first Neolithic entity, for an important part on the basis of the assumed

presence of domesticated grain: here we would have the very first farmers. However, as discussed earlier, it seems that the evidence for domestic plants is tentative at best. "There is no archaeobotanical evidence—the *only* reliable form of evidence for plant domestication—in the Levantine PPNA, and therefore no evidence that agriculture started there first" (Nesbitt, 2004, p. 38). How Neolithic is the PPNA in the end? Nesbitt (2002, p. 124), again: "While the PPNA continues to be a useful chronological term, the use of the beginning of the Neolithic as marking a major transformation in human societies may be inappropriate." Moreover, with regard to symbolic behavior, there is also considerable continuity (see later).

In spite of the apparent lack of good evidence for plant domestication in the PPNA, secondary evidence (the presence of weeds typical for domestic grains, at sites such as Hatoula and Mureybet (Willcox, 1996), and the presence of sickle blades, grinding/pounding implements and probable storage features, such as at Netiv Hagdud and Gilgal) indicates cultivation in the PPNA. Most of these sites were located in the drier inland areas (and not the Mediterranean coastal areas), but always near alluvial fans, springs and lakes, providing fertile soils. It is important to realize that cultivated cereals and legumes were only part of the diet; wild fruits and seeds continued to be collected.

Important environmental factors were involved in the accessibility and controllability of grain. In this respect, it is important to realize that certain species (such as wild grains) lend themselves well, are *pre-adapted* for serving humans, whereas other species are not very well suited for domestication. However, farming could not have taken hold without the material culture rooted in the Natufian: sickle blades for harvesting, grinding/pounding tools for processing and pits and bins for storage. Culture was ready (cf. Braidwood, 1960). Cultivation of grain must have been closely related to the obvious opportunities:

- yields are in principle dependable and large;
- its occurrence in dense stands makes collection relatively easy;
- it is a good source of energy;
- it is easy to store, thus providing economic and social security (see also Benz, 2000, p. 89).

Given the probable absence of domestic species, the apparent ties to earlier Natufian ways of life, the flora and the fauna (see Table VI), it seems proper to regard PPNA people as complex hunter-gatherers, rather than farmers. Perhaps, though, given the evidence for intensified cultivation, the term "proto-farmers" is justified.

Ritual and Symbolism

As indicated earlier, the house probably played a central social and symbolic or ritual role in the PPNA, and there are many examples of PPNA "household rituals." In other instances, too, skulls and horncores of wild cattle or aurochs (*Bos primigenius*) are repeatedly associated with houses, either buried in benches or walls (as at Jerf el Ahmar and Mureybet; Cauvin, 2000, p. 28). Apart from animals, there are also indications for house rituals related to humans or ancestors. For instance, at Jerf el Ahmar a deposit of three human skulls was found in the remains of an exterior oven. Skull deposits in houses at other PPNA sites (such as Qermez Dere in northern Iraq), depositions of human crania, and peculiar, non-structural clay pillars also betray ritual activities (Watkins, 1990).

Apart from these house-related rituals, there are good indications for communal ritual practices in the PPNA. For example, at Jerf el Ahmar on the Syrian Euphrates, a number of large round subterranean buildings have been found that seem to have been communal and multi-functional (used for storage, meetings and rituals (Stordeur, 2000a,b, 2003a)). They were supplied with stone benches, engraved friezes and, probably, wall paintings. Apart from triangles, humans and birds of prey were depicted. In another building that was completely burned, a decapitated human skeleton with outstretched arms was found on the floor of the central room. This association seems to indicate an abandonment ritual in which the building was purposely set on fire (Verhoeven, 2000, p. 62). PPNA/Early PPNB layers at Göbekli Tepe in southeast Anatolia have also yielded fascinating evidence of what were undoubtedly communal ritual practices, indicated by several circular stone buildings with terrazzo floors and large decorated T-shaped pillars with various animal depictions (snakes, foxes, wild boars, birds, etc.), which most often occur in combinations. Moreover, there is a large amount of stone sculpture with various human and animal depictions. This sculpture also includes therianthropes (such as a bird on a human head). Up to 2003, four enclosures (such as the "snake pillar" and "lion pillar" buildings) with 39 pillars had been uncovered *in situ* (Schmidt, 2003). This most spectacular and enigmatic of Early Neolithic sites has been interpreted as a communal ritual center for hunter-gatherers (Schmidt, 2001, 2002). In this view, the anthropomorphic pillars in the shrines represented gods, ancestors or devils who were the focus of ritual and worship (Schmidt cited in Warburton, 2004, p. 185).

At Hallan Çemi in eastern Anatolia, two circular buildings (A and B) were set apart from the other buildings. They were differentiated by their relatively large size, semi-subterranean nature and the presence of stone benches along the walls. These special, perhaps communal, buildings

contained exotic materials such as copper ore, rather than domestic items. Moreover, on the floor of one of the buildings were found parts of a bull skull with horns, most likely hung on the wall originally. An arrangement of three sheep crania with horncores in a central activity area strongly suggests ritual practices as well (Rosenberg and Redding, 2000).

PPNA burials are often single and without gravegoods, and the adult burials are often without skulls. They are generally found under house floors. In Mureybet (phase III), for instance, a female skull and long bones were buried under a small basin-shaped hearth; the rest of the skeleton was interred outside the house. In Jericho, groups of human skulls were inhumed. In Netiv Hagdud, a cluster of crushed human skulls was found on a house floor. Interestingly, many infant/child burials were located under postholes and under walls (Kuijt, 1996).

Figurines mainly depict humans, as opposed to the Natufian when animals were commonly depicted. In the southern Levant, zoomorphic and geometric depictions are absent. According to most researchers, especially Cauvin, the human figurines of clay and stone, most often seem to depict women with an emphasis on sexuality and fertility: prominent belly, vulva and breasts. Clearly, women are depicted (for example, Cauvin, 2000, Fig. 7, No. 2, Fig. 8, No. 1). However, it seems to me that many of these figurines are of a transitional, liminal nature and represent a phallus and a female at the same time (Fig. 9; and see Cauvin, 2000, Figs. 6 and 8, Nos. 2–4, Fig. 13; see also Gopher and Orelle, 1996; Kuijt and Chesson, 2005; Schmandt-Besserat, 1998 for ambiguity in Neolithic figurines). Abstract engraved designs, such as zig-zag lines, have been noted on stones at various sites (such as Hallan Çemi: Rosenberg and Redding, 2000, Fig. 6). Remarkable is the collection of engraved stones from Jerf el Ahmar, with complicated patterns of naturalistic and abstract designs (such as a vulture, snakes, a quadruped, "horncores," raster [grid], and so on; Stordeur, 2000b, Fig. 10).

Holistic Relations

Although it is clear that there are differences between the PPNA and the Natufian, it seems that on the whole some earlier socio-cosmic relations were maintained and further developed. To start with the human burials, the frequent recovery of headless skeletons and skulls (either on floors or inhumed) strongly suggests that the veneration of ancestors now took a firm hold in society. The fact that the burials are often located under house floors reinforces this close tie between the living and the dead. Moreover, there are clear examples of symbolic human–animal relations, mostly from burial contexts. At Hatoula in central Israel, for instance, an

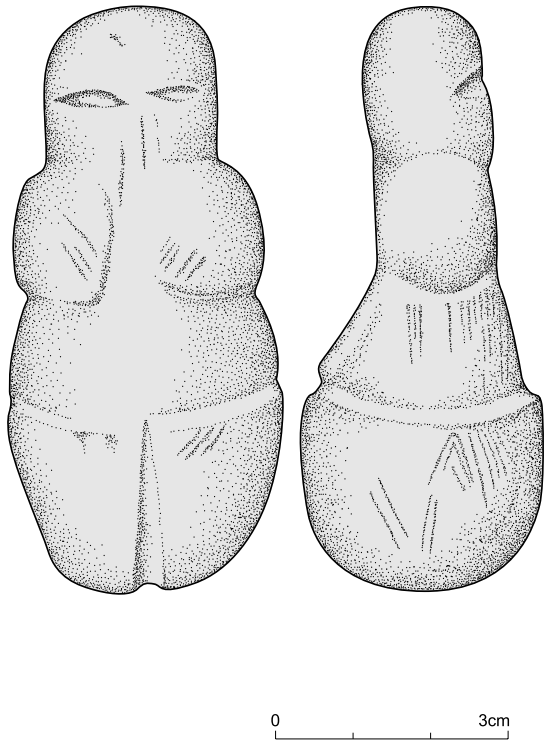


Fig. 9. Anthropomorphic stone figurine from Pre-Pottery Neolithic A Salabiya IX, north of the Dead Sea in Israel. Commonly such figurines are regarded as female representations, but here it is suggested that they are combined representations of a penis and a female. After Bar-Yosef (1980). Redrawn from Cauvin (2000, Fig. 6, No. 1).

association of an adult human parietal with a gazelle horncore, a pestle and pebbles (human–animal–plants?), and an adult female associated with fragments of a wild-bull cranium have been reported (Lechevallier and Ronen, 1994, pp. 27, 296). At Abu Hureyra on the Syrian Euphrates, horncores of cattle and caprines were deliberately deposited in human burials (Moore *et al.*, 2000). A most interesting recent example of the symbolic association between human death and animals comes from a decorated bench in one of the subterranean communal ritual buildings at Jerf el Ahmar. Here, between two stylized stelae of birds of prey, was a stone slab apparently depicting an incised headless skeleton (Helmer *et al.*, 2004, p. 158).

The recovery of aurochs skulls and horncores in PPNA buildings reveals a symbolic concern with bulls. According to Jacques Cauvin (1972,

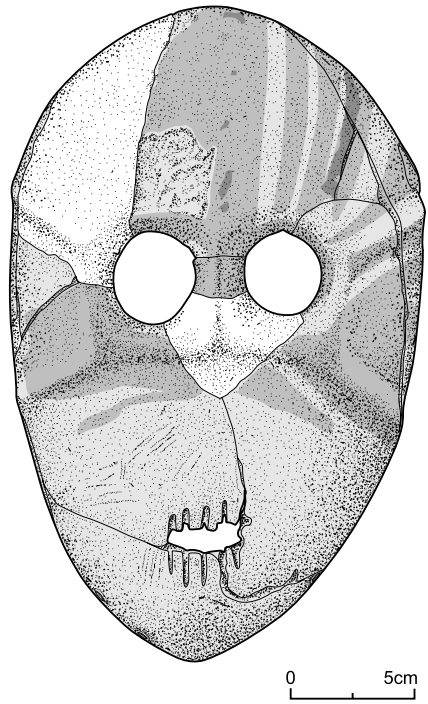


Fig. 10. Stone mask from Pre-Pottery Neolithic B Nahal Hemar, southwest of the Dead Sea in Israel. This mask was found in a cave, among many special objects, including basket work, textile fragments, bone figurines of human heads, fragments of another stone mask and skulls of adult males (one with a collagen net pattern on the back). The mask has been painted red and was further decorated by a painted radial design in green. The teeth were marked by white paint. Moreover, patches bitumen, some with hair, were attached round the mouth (to indicate moustache and beard?), on the head and around the edge. After Bar-Yosef (2003). Redrawn from O'Neill and Howard (1986, p. 49).

2000) the "female" figurines and the bulls indicate a "revolution of symbols" and a "new religion of the women and the bull" (see earlier). The interesting point that Cauvin makes is that people chose the undomesticated bull to play a central symbolic role in domestic contexts (the house). Thus, again, we have evidence for a (liminal) relation between quite differ-

ent entities: people, houses and bulls. At Göbekli Tepe, for instance, there is not only evidence for relations between many different kinds of animals (as sculpted on the pillars), but also for therianthropes. Moreover, there is still some evidence for animal–plant symbolism, such as the sculpted pestles of Hallan Çemi. It is to be expected that these aurochs skulls and horncores had a ritual significance, referring to the (danger of) hunting such a mighty beast. The rather secluded nature of the aurochs skulls, which were located, or even hidden, in houses may indicate a household level of significance.

This suggested liminal character of some human figurines, representing male and female at the same time (Fig. 9), seems to indicate a new symbolic relation. Indeed, as Bradley (2001), amongst others, has noted, the merging of human and animal identities is a feature that was present before agriculture in many other areas in the world as well. Perhaps this is not surprising in a context where humans gradually changed their surroundings (settlement, plants, etc.).

In conclusion, there are some dramatic examples of symbolism from the PPNA, involving ancestors, wild bulls, communal buildings and houses. As in the Natufian, the symbolic web seems to have been especially focused on the relationships between the living and the dead. On the basis of a holistic perspective on ritual, it can be argued that these rituals were meant to influence "the circulation of beings along the relations that constituted the socio-cosmic universe" (Barraud and Platenkamp, 1990, p. 117). The fact that ritual was apparently more important, or, perhaps better, was given clearer material expression in the PPNA than in the Natufian makes good sense in the context of the ongoing, intensifying, and growing process of domestication.

Florescence (Early PPNB–Middle PPNB)

Subsistence and Material Culture

As indicated in Table VII, the issue of the presence of the Early PPNB in the southern and central Levant is still unresolved, but, overall, during the PPNB the process of domestication spread and intensified further (see Table VII):

- sites and possibly settlements became larger;
- buildings were rectangular and often consisted of many small rooms, indicating increasing internal differentiation and manipulation of space;
- many different objects were now in use;

– many indications of public rituals seem to show closer relations with the supernatural;
– there is the first uncontested evidence for the domestication of plants (cereals, pulses), and animals (goats, sheep, pigs and cattle).

With regard to the domestication of plants and animals, I largely adhere to models proposed by Jarman *et al*. (1982), Harris (1996a) and Smith (1998). These models consist of a series of phases of intensifying relations. Harris has presented these evolutionary models in detail, so that the following accounts are confined to the basics. It is important to note that these scenarios generalize, representing the most "logical" processes; other schemes are therefore feasible. In fact, different explanations for domestication need not be mutually exclusive; it is likely that, depending on the environmental and cultural context, there were different trajectories (Harlan, 1995; see also Belfer-Cohen and Goring-Morris, 2003, and Henry, 1989, p. 10). Moreover, although the phases may seem to indicate conscious attempts by prehistoric people, they should rather be seen as analytical stages of an evolutionary process, with unconscious as well as conscious aspects. As the domestication of plants and animals in the PPNB is here regarded as the outcome of a long process, the following accounts start in the Epipaleolithic period.

Phase 1: Gathering (Natufian, PPNA, Early PPNB). As in the Natufian, people in the PPNA took advantage of favorable environmental circumstances (opportunity), including dense stands of wild grain. Due to past experience and a suitable set of material culture, the harvesting of wild grain was a successful subsistence strategy. Moreover, in order to increase the abundance of certain plants, fire may have been used systematically (Harlan, 1995, pp. 10–11). Casual gathering may have developed into systematic gathering.

Phase 2: Cultivation (PPNA, Early PPNB). As Harris (1996a) has pointed out, it is likely that cultivation proceeded from small-scale clearance of vegetation and minimal tillage (horticulture) to larger-scale manipulations, or, in other words, from limited to developed, to intensive cultivation. The location of early farming villages near alluvial soils and water indicates that fields, or gardens, were situated near the settlements. Bringing wild grain into domestic contexts may have proceeded in a co-evolutionary manner, as suggested by Smith (1998, pp. 20–21). He points out that permanent disturbed habitats around villages have three important characteristics: (1) they are open to colonization by plants that are adapted to disturbed habitats; (2) they are close to settlements where hunter-gatherers could accidentally have dropped seeds of harvested wild stands and thus have introduced colonizers; (3) disturbed patches of soil

near villages had characteristics that were similar to prepared seedbeds of garden plots: they may well have provided the contexts for the deliberate planting of stored seed stocks in order to increase the yield and dependability of wild species. Discussing Anderson's (1952) "dump-heap hypothesis," Blumler (1996, p. 39) points out that cereals are relatively late colonizers of disturbed areas, while legumes do not fare well on nitrogen-rich dump soils. This, however, does not necessarily weaken the earlier scenario, since the disturbed areas were not necessarily dump heaps or places of, for instance, dense stands of wild grain. Rather, these places made people aware of the possibility of cultivating grains near their settlements.

Phase 3: Domestication (Early PPNB). In some instances, by means of coevolution, cultivation resulted in domestication either unintentionally or intentionally through experimentation with wild grasses in order expand yields. This was marked by cultivars and a greater labor input: sowing, weeding, harvesting, processing, storing, and so on.

Phase 4: Intensification (Middle, Late and Final PPNB/PPNC). Seasonality of precipitation in the Holocene may have stimulated more intensive cultivation and storage of grain in order to survive the dry seasons, as argued by McCorriston and Hole (1991). Likewise, on the basis of stable oxygen isotopes in goats' teeth, recently Hallin, Schwarcz, Schoeninger and Levy (cited in Belfer-Cohen and Goring-Morris, 2003, p. 143) have tentatively argued that the PPNB witnessed a transition to winter-only rains, leading to more storage. As has often been pointed out, once established, agricultural village life may dialectically have perpetuated sedentism and cultivation, with permanent (storage) structures, processing facilities, etc. resulting in less mobility, which led to more sedentism, and so on (path-dependence). However, as indicated before, Neolithic society seems to have been flexible rather than static and people must have been capable of breaking out of this sequence. Changing subsistence strategies, fissioning and birth control are among the alternatives for coping with the negative effects of a "village-farming" way of life.

With respect to plants and our dependence on them, Harlan (1995, p. 240) has asked who the domesticated are: did people domesticate plants or did plants domesticate people? I would argue that, in a reciprocal fashion, people and plants domesticated *each other*.

Animals were domesticated relatively late in the sequence of domestication events. It has been suggested that this is because (semi-)permanent villages are prerequisites for successful animal domestication; only field stubble and surplus straw from harvested fields would have provided a stable source of food to support livestock herds (Smith, 1998, p. 83). Like cultivated plants, domestic animals had some clear economic and social advantages: they were a buffer in times of food shortage; apart from meat and

milk they provided important "secondary" products such as blood, horns, skins/hair; they could be used for traction and transport; they may have indicated wealth and prestige of people; and they were exchanged. Thus, as was the case for sedentism and plants, opportunistic behavior goes a long way in explaining events.

Like the model for plant domestication, the following model for animal domestication consists of a series of phases of intensifying human–animal relations.

Phase 1: Predation (Kebaran, Natufian, PPNA, Early PPNB). People were generalized or specialized hunters and fishermen (but note that the dog was domesticated in the Natufian). Random, or opportunistic, predation may have evolved into controlled, or planned, predation.

Phase 2: Separation and protection (PPNB). Some very young animals may have been separated from wild populations to be tamed (Tani, 1996, p. 401). Furthermore, herds were perhaps protected by separation or by killing their predators. Free-range management is also a possibility, animals being loosely controlled in semi-wild habitats and rounded up as required. Herd-following may have evolved into loose herding and then close herding. The phase of isolation of wild animals has been termed "incipient domestication" by Horwitz (1989). Harris (1996a, p. 453) has put forward the interesting suggestion that the provision of salt, which is highly appreciated by many ungulates, was one of the principal means of establishing influence over herds.

Phase 3: Domestication (PPNB). Subsequently, by bounding space, food supply and reproduction, the life cycles of captive populations were actively manipulated, resulting in domestication.

According to Uerpmann (1996), the first domestication of sheep and goats was a natural process, without human intentionality. The process would have started because of a combination of natural and social factors: sedentary ways of life, the "grain-based economy" and the pre-adaptedness to (a niche of) secluded surroundings of sheep and goats (as opposed to most other animals). Through time, the animals attracted by the grain fields and early cultivators would have developed a symbiotic relation. In my view, this scenario does not necessarily exclude human intentionality, as decisions about capture and confinement had to be made. It is indeed likely that on the whole the process of animal domestication was unintentional in the sense that outcomes were not foreseen, but it is unlikely that people never realized what was going on. However, it all depends on one's definition and the assumed starting point of domestication. In this regard, also discussing the role of unconscious selection in the domestication of sheep and goat, Zohary *et al.* (1998) argue that soon *after* founder herds were formed it was unconscious rather than conscious selection that was respon-

sible for molding the morphology, behavior and physiology: that is, the domestic characteristics of these animals. These changes were due to a number of changes in human–animal relations: establishment of close contact with humans; human protection from predation; culling of young males; protection from the elements; availability of food and water. Mixed agriculture (farming and herding), transhumance and nomadic pastoralism were the outcomes of the process of animal domestication (see also Tchernov, 1998).

Commonly, studies of the domestication of animals focus on economic utility: that is, on strategies of maximizing yields of primary and secondary products (meat, milk, hides, etc.). However, as Keswani (1994) has argued, while such models appear to be useful for interpreting state or market-centered economies, they may be problematic with regard to "pre-state societies." In fact, there are many ethnographic, and a few archaeological, examples of the primary role of socio-ideological dimensions in the production and consumption of animal husbandry. More specifically, the ethnographic literature suggests that in "traditional" societies animals are foremost raised and exchanged in the context of rituals, such as festivals, feasts, sacrifices, life-cycle events. With regard to the husbandry of pigs in the central New Guinea highlands, for instance, Meggitt (1977, pp. 7–8) has observed that: "Pigs, however, are raised primarily as valuables to be circulated in prestige-enhancing exchanges; they are rarely killed and eaten outside ritual and ceremonial occasions." Keswani (1994, p. 262), therefore, proposes that in many pre-state agricultural communities there may be a positive correlation between intensification of animal husbandry and evidence for the intensification of ritual activities and related social exchanges. Interestingly, this is indeed what we see in the Levantine PPNB. For example, it is well known that many PPNB sites show a symbolic concern with wild cattle (see later).

On the basis of this, a number of authors (such as Bar-Yosef, 2000; Cauvin, 2000; Hahn, 1909; Harlan, 1995, pp. 18–20; Harris, 2002; Simoons, 1968) have argued that cattle domestication in the PPNB of the Levant initially involved a free-ranging management of aurochs largely for symbolic and ritual reasons, perhaps to be sacrificed to ensure fertility and prestige to their owners, as well as providing meat. As yet, these hypotheses are difficult to substantiate, but it is important to acknowledge that food resources are not only related to survival, but also to social and ideological aspects. In other words, again, when dealing with domestication we need to take into account that it probably was a multi-facetted phenomenon, not related to subsistence, social structure and cognition alone, but involving many dimensions. Of course, according to local and cultural contexts, some dimensions may have been more important than others, but this has to be investigated, not assumed beforehand.

Ritual and Symbolism

As is well known, PPNB sites (especially from the Middle PPNB) such as 'Ain Ghazal, Jericho, and Kfar HaHoresh in the Levant, Dja'de in Syria, and Nevali Çori, Çayönü and Göbekli Tepe in southeast Anatolia have yielded quite spectacular remains which are commonly held to represent ritual practices (Bienert, 1991, 1995; Coqueugniot, 1999; Goren *et al*., 2001; Goring-Morris, in press; Horwitz and Goring-Morris, 2004; Kuijt, 2000b; Özdoğan and Başgelen, 1999; Rollefson, 2000; Schmidt, 2001, 2002, 2003; Stordeur, 2003c). As ritual, symbolism and ideology in the PPNB have been extensively dealt with elsewhere (Kuijt, 2000b; Rollefson, 2000; Verhoeven, 2001, 2002a), the indications for PPNB rituals in the Levant and southeast Anatolia are summarized in Table IX.

I have proposed that PPNB ritual and ideology were characterized by four basic structuring principles (Verhoeven, 2002a). *Communality* refers to the observation that many PPNB rituals seem to be marked by public display (ritual buildings, statues, masks, stelae). *Dominant symbolism* indicates the use of highly visual, powerful and evocative symbols (Fig. 10). *Human–animal linkage* denotes the physical and symbolical attachment of humans with animals, noted in for example sculpture and burial contexts (Table X and Fig. 11). The concept of *vitality* mainly refers to fertility (that is, soil fertility and birth-giving), and to the related notion of sexuality. Moreover, it denotes *life-force:* the vital power which principally resides in the head.

Table IX. Indications of PPNB Ritual Practices (Based on Verhoeven, 2002a, Table 5)

Indications	Contexts
Ritual buildings	Large statuary
	Furniture: hearths, basins
	Residues of human and animal blood on stone slabs
	Aurochs horncores
Burials	Burials, including decapitated skeletons in domestic areas, ritual buildings and special (ritual) sites
Skull caches	Domestic areas, ritual buildings, special (ritual) sites
Plastered skulls	Domestic areas
Symbolic human–animal relations	In burials in domestic areas, ritual buildings, special (ritual) sites
	Therianthropic sculpture in ritual buildings
Large statuary	Ritual buildings, caches (pits)
Figurines	Domestic areas
Horncores (especially of cattle)	Domestic buildings, ritual buildings, burials

Table X. Symbolic Human–Animal Relations in Selected PPNB Sites in the Levant and Southeast Anatolia (Based on Verhoeven, 2002a, Table 7)

Site	People–(wild) animal relations
'Ain Ghazal	PPNC burials: humans–pig skulls and other pig bones
Basta	Therianthropic figurine of phallus/ram's head
Kfar HaHoresh	Many different spatial relations of human and animal remains (burials), e.g.: Animal depiction executed in human bone; Decapitated skeleton–aurochs bones in "*Bos* pit"; Plastered skull–decapitated gazelle skeleton; Head of infant–bovid pelvis; Human bones–fox mandibles; Cache of four human skulls and two gazelle horncores; Human remains–inverted mandible of wild boar
Nevali Çori	Therianthropic sculpture: Human–bird (vulture?); Humans–tortoise(?); Human–snake
Çayönü	Spatial relations: Human skeletons–aurochs skulls and horncores (Skull Building) Blood: Blood of humans, aurochs and (wild?) sheep on "altar" (Skull Building); Blood of humans and aurochs on flint knife (Skull Building) Burial: Boar's jaw in human burial
Göbekli Tepe	Large therianthropic sculpture: Animal with human head; Bird on human head; Animal on human head The large T-shaped monoliths were probably anthropomorphic, if so: humans–various wild animals as depicted on the monoliths

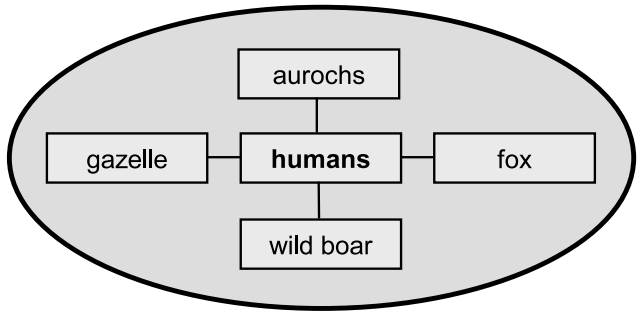


Fig. 11. Symbolic human–animal relations at PPNB Kfar HaHoresh in Israel. Based on Horwitz and Goring-Morris (2004).

Holistic Relations

On the basis of the marked ritual and symbolism, in particular, I would like to argue that the PPNB represents a florescence of the process of the manipulation of holistic relations and domestication. Most likely, the marked PPNB ritual symbolism was an expression of the desire to influence ritual behavior and the supernatural world, in order to manipulate the human world. The common occurrence of (1) burials under floors, (2) the manipulation of (plastered) human skulls, (3) public rituals, and (4) clear symbolic human–animal relations (Table X), all based on a long tradition, are of an importance that would not return in Levantine prehistory.

Hodder (1990, p. 36) has rightly argued that the origins of agriculture in the Near East took place within a complex symbolic web that centered around the house and death. New data allow us to define some more nodes of the web. Especially interesting are the marked symbolic human–animal associations, which are indicative of hitherto unexpected relations between "nature" and "culture." Intriguing in this respect is skull manipulation at Kfar HaHoresh. Here, in the "*Bos* pit," a decapitated human skeleton was associated with the headless remains of wild bulls, and a gazelle interment without a skull was related to a plastered human skull (Horwitz and Goring-Morris, 2004).

It seems that the so-called PPNB skull cult, marked by the display, caching and occasional decoration of human skulls, involved more than the traditionally assumed ancestor worship. First, plastered skulls belong to males as well as females and range in age from young (children) to young adult and old adult (Bonogofsky, 2001). Second, a relation between skull deformation during life and the selection of these skulls for ritual treatment *post mortem* has been noted (Meiklejohn *et al.*, 1992). Third, it seems to be the case that in many cultures all over the world (human) skulls are regarded as powerful symbolic and ritual objects which refer to life-force, fecundity and related concepts. Therefore, I have argued that while ancestors, as mythical persons, were probably worshipped in the PPNB, human skulls (plastered as well as unplastered) were especially honored because they were the seat of life-force, which could be used to ensure fecundity (to the fields, domesticated animals and women) and well being. Moreover, apart from ancestors, skulls may have been selected for special treatment because some persons were regarded as cultural heroes (successful hunters?). Life-force, ancestor and hero worship are not mutually exclusive: rather, the latter venerations are aspects of life-force. The evidence of Kfar Hahoresh seems to include yet another zoomorphic dimension to PPNB skull manipulation, again indicative of holistic relations (Goring-Morris and Horwitz,

in press). Moreover, human burials were not only associated with animal remains (all wild) but also with colored and often polished pebbles, shells, flint caches and burnt lime (Goring-Morris and Horwitz, in press).

It thus appears that the manipulation of skulls in the PPNB, revolving around the manipulation of life-force, had many dimensions. For example, Kfar Hahoresh, probably serving as a special burial center for surrounding populations, showed a variety of skull manipulations including skull removal related to human skeletons of all ages and sexes; skull plastering of young adult males; skull removal of various animal species. At Dja'de the "maison des morts," containing some 60 human skeletons represented by primary inhumations, groups of skulls, and other separately buried parts, was spatially associated with a wild bull bucranium (Coqueugniot, 2000).

With regard to ancestors, a study by Bird-David (1990) of the subsistence of the Nayaka hunter-gatherers in South India is interesting. She argues that these people regard the forest in and off which they live as a parent, which *gives* food to its children. Neighboring groups of cultivators, however, liken the environment to an ancestor, with which there is a reciprocal relation: favors have to be returned. Perhaps the early cultivators' marked attention to ancestors in the PPNB also points towards such an "ancestral economy."

In the PPNB, the domestication of plants, animals, the built environment, and society became well established. For instance, the almost obsessive compartmentalization, most likely having to do with storage, is a good metaphor for the intensiveness of segregation, manipulation and domestication in the PPNB (Fig. 12). As in the Natufian and the PPNA, it was the village and its dwellings that acted as a microcosm, as a place where pivotal cultural ideas and rules were materialized and symbolized and given meaning through *dwelling* and human practice. As Watkins (2004, p. 11) has put it: architecture brought together the social, cultural, physical and the metaphysical. The village was a focal point where farmers, pastoralists, hunters, ancestors, animals, plants, objects and so on were related at different times and in different ways (Fig. 4). Ritual may have been one of the most powerful of these ways. Indeed, even after thousands of years one is struck and impressed by the remains of these rituals.

Development (Late PPNB)

The Late PPNB in the southern Levant was marked by considerable changes in settlement organization. Almost all Middle PPNB sites of the Mediterranean zone were abandoned in the Early PPNB. To the east, however, large Middle PPNB sites such as 'Ain Ghazal and Wadi Shu'aib continued to be occupied. Moreover, many new and large Late PPNB

Fig. 12. Plan of the central area of the Late PPNB level 3 settlement at Tell Sabi Abyad II in the Balikh Valley of northern Syria. The various buildings are closely attached. Domestic spaces are attested, but most of the small rooms probably served for storage. A large platform in the north may have been the locus of special activities. Redrawn from Verhoeven (2004, Fig. 3).

settlements, such as Basta and 'Ain Jammam (the "megasites"), were founded east of the Jordan valley, in previously largely unoccupied areas, and deserts were now regularly used for human purposes. There were other changes, too (see Kuijt and Goring-Morris, 2002), but on the whole the PPNB way of life was continued and further developed. In the northern Levant PPNB sites such as Halula and Abu Hureyra continued to be occupied (but Mureybet was deserted). With regard to burial practices, skull removal and skull plastering continued, and there even was an increased association of humans with animals in graves. Finally, in the Late PPNB

cattle became domesticated, and now the entire agricultural package (domesticated plants and animals) was in place.

Dispersal (Final PPNB/PPNC–Pottery Neolithic)

Subsistence and Material Culture

On the basis of large-scale patterns of site abandonment, it has often been argued that in the Final PPNB/PPNC and Early Pottery Neolithic there was a gradual return to tribal society in the Levant and a consequent social fragmentation and segmentation. This process was originally referred to as the *Hiatus Palestinien*, but this term is hardly used anymore, probably because it is not so much a hiatus as a transformation that we are dealing with: settlements or people did not disappear, but were organized differently (Akkermans and Schwartz, 2003, p. 111). The reasons for the deterioration and eventual abandonment of PPNB sites are debated (see, for example, Simmons, 2000; Verhoeven, 2002b). Environmental explanations (desiccation of the environment due to a supposed warming and drying trend of the Middle Holocene) have often been put forward as a possible cause (Bar-Yosef, 2002, p. 122). However, the evidence for desiccation is controversial, as there are also indications for a moister phase at this period. Thus, as I have argued elsewhere (Verhoeven, 2002b, pp. 11–12), the apparent break in cultural traditions may have been triggered by a combination of economic and social factors. Fragile environments were perhaps degraded due to uncontrolled extensive(?) agricultural and pastoral activities. Indeed, the organizational structure of the PPNB, marked by community rituals and a lack of clear leadership may not have been able to cope with these interrelated problems, which finally resulted in the demise of PPNB society.

It should be noted, however, that although there were important changes, recent research indicates that there was also continuity in various places. As Akkermans and Schwartz (2003, p. 112) have pointed out with regard to Syria, for example, occupation continued at Halula and Bouqras near the Euphrates, and probably also at Tell Sabi Abyad I in the Balikh Valley and Tell Seker al-Aheimar in the Khabur Valley (Akkermans *et al*., in press; Nishiaki, 2002). In southeastern Anatolia, near the Euphrates at Birecik, the recently investigated site of Mezraa-Teleilat also shows continuation between the PPNB and the Early Pottery Neolithic (Özdoğan, 2003).

In general, in the Early Pottery Neolithic a number of PPNB traits are continued and further developed: sites mainly consist of tells located in

valleys; architecture is mainly rectangular and multi-roomed; a mixed economy of farming and herding (including pastoralism) of domestic species now becomes well established (but hunting still plays a major role in many contexts); and artifacts such as projectile points, grinding slabs, pestles, mortars, bone awls, spindle whorls, and items of personal adornment are very common. Pottery, of course, was introduced, but its role should not be over-emphasized. In this respect, Akkermans *et al.* (in press) have recently questioned whether the invention of pottery made much difference in Neolithic communities. It can be argued that in the beginning pottery was probably little more than another kind of useful container, in addition to white ware, basketry, and so on. Moreover, they point out that the manufacture and use of pottery probably did not follow a simple unilateral trajectory. It is quite conceivable that while some communities used pottery, others adopted it much later, or remained fully aceramic. In this respect, the recent research at Tell Sabi Abyad I indicates a considerable continuity of the PPNB into the Early Pottery Neolithic. This is suggested by settlement patterning and stratigraphy and by material culture such as tanged arrowheads, plaster floors, and stone vessels. Only at ca. 6300 cal. B.C., well into the Pottery Neolithic, were there major alterations at the site, such as new types of architecture (including circular *tholoi*), objects (seals and sealings), intensification and differentiation of the use of pottery, and subsistence changes (Akkermans *et al*., in press). The latter refer to a probable intensification of pastoralism (Akkermans and Schwartz, 2003, pp. 126–131). Hunter-gatherers, moreover, still roamed the landscape. Thus, economically as well, the Neolithic may have been marked by fluid rather than strict boundaries. Notwithstanding the probably flexible nature of Pottery Neolithic society, it is clear that village life was now well established and that people were surrounded by a "web of materiality" (Whittle, 1996, p. 359) which surpassed that of earlier human communities.

Ritual and Symbolism

There are a number of examples which point to a continuation of PPNB ritual traditions in the Pottery Neolithic period. At Late Pottery Neolithic (Late Halaf) Domuztepe in south-central Turkey the so-called Death Pit has given evidence of complicated patterns of deposition of the skulls of 35–40 people and of animal bones. Fractures in some skulls even suggest deliberate removal of bone, perhaps to access the brain. Furthermore, an isolated skull burial (probably in a basket) has been observed (Carter *et al*., 2003). Interestingly, the bones were associated with a number of headless human (probably female) figurines made of stone, and an

ambiguous figurine which seems to represent both a penis and a female (Carter *et al*., 2003, Figs. 12 and 15). Decapitated skeletons and skull interments have also been noted at other Late Pottery Neolithic sites, such as at Arpachiyah and Yarim Tepe II in northern Iraq. Communal ritual as suggested by the Death Pit also seems to have played a role at Pottery Neolithic Tell Sabi Abyad I, where an abandonment ritual involving the conflagration of the settlement probably involved the entire community (Verhoeven, 2000). Although situated well outside the Levant, of course, Çatalhöyük in Anatolia should be mentioned here as a prime example of an intricate network of symbolic relations, between, for example, men, women, life, death, domestic and wild (Hodder, 1987).

Notwithstanding these examples, when comparing the PPNB and Pottery Neolithic as two wholes, rituals are rather different. In most cases, dramatic indications for ritual, such as are found in the PPNB and, to a lesser extent in the PPNA, are absent in the Pottery Neolithic. Indeed, apart from burials and figurines there are only a few clear indications of ritual practices (see Table XI). Moreover, the symbolic and ritual focus on the house decreases; for example, houses are less often decorated (with, for example, bucrania) and burials are now often located outside the domestic context. In general, Pottery Neolithic rituals were marked by *domesticity*, referring to domestic, secluded, private kinds of ritual practice, probably related to individuals and households (Verhoeven, 2002b).

Holistic Relations

The reasons for the changes in ritual practices are as yet difficult to comprehend. Perhaps it has to do with the fact that some of the greatest

Table XI. General Changes in Ritual Practices Between the PPNB and the Pottery Neolithic (Based on Verhoeven, 2002b, Table 1a)

Indications for ritual practice	PPNB	Pottery Neolithic
Ritual buildings	C	R
Statues	O	A
Stelae	O	A
Masks	R	A
Symbolic human–animal relations	O	R
Wall and floor paintings	R	R
Decorated stones and bones	O	R
Caches	C	R
Horncores	O	R
Human skull manipulation	T	R
Human figurines	T	T
Animal figurines: general	T	T
Animal figurines: bull	C	C

Note. A: absent, R: rare, O: occasional, C: common, T: typical.

"achievements" of domestication—that is, the cultivation of plants, the herding of animals, village life, and the profusion of material objects—had been established in the Pottery Neolithic. In a sense, the intensive manipulation of socio-cosmic reciprocal relations (Figs. 5 and 6) may have become less necessary. However, the findings of headless figurines and skulls and a male/female figurine from the Death Pit at Domuztepe do suggest a variety of symbolic and holistic linkages. In quite another sense, pottery, especially decorated ceramics (such as in the Halaf culture: Fig. 13), also brought together different dimensions. Pottery enabled humans to manipulate materials (transformation of clay into ceramics), goods (food—plants and animals—, storage, etc.) and perhaps other people. With regard to people, so-called conventional symbolism represented by Neolithic decorated pottery, together with occasional communal rituals, may have played an important role in the manipulation of social relations (Verhoeven, 2002b). Thus, in a holistic fashion, pottery linked quite different contexts. However, we should not overelaborate on the concept of holism. Holistic relations such as have been suggested for the earlier periods, and as evidenced by ritual and symbolism, seem to have been of far less importance or of a rather different order in the Pottery Neolithic. Domesticated plants and animals

Fig. 13. Decorated Halaf ceramic vessel from Pottery Neolithic Tell Sabi Abyad I, northern Syria. The decoration of this small jar, a complicated pattern in one zone on the body, is characteristic of the Early Halaf period at Sabi Abyad I. Redrawn from Le Mière and Nieuwenhuyse (1996, Fig. 3.45, No. 9).

and the village-farming way of life became ever more important. Domestication in the Pottery Neolithic, then, may have been of a different order from that in the preceding periods: more economic and less ritual and symbolic. As Whittle (1996, p. 370) has put it: "Neolithic people may have been more conscious of their separate place in the scheme of things" (see also Thomas, 1991).

SIGNS OF THE TIMES?

We have seen that there were marked cultural continuities from the Epipaleolithic to and within the Neolithic. Not only in subsistence (hunting-gathering, cultivation of wild grain) and architecture (round dwellings), but also in symbolic and ritual materials and practices. With regard to ritual and symbolism, Goring-Morris (in press), and Goring-Morris and Belfer-Cohen (2002) have noted continuity from the Natufian deep into the Neolithic for (1) animal symbolism, related to, for example, fox, aurochs, wild boar and birds of prey; (2) human skull manipulation; (3) symbolic use of spaces, such as cemeteries, dwellings and "special buildings"; (4) special features such as monoliths and basins; (5) large statuary; (6) burials; (7) decorated objects (graphic art). Actually, continuity in lithics from the Natufian into the PPNA has also been demonstrated, with a major break occurring at the PPNA–PPNB transition (Belfer-Cohen and Goring-Morris, 1996).

On the basis of the preliminary analysis of symbolic holistic relations, I would like to add that, possibly starting in the Epipaleolithic (Kebaran) and continuing into the Neolithic, people were concerned with the manipulation of holistic relations between humans, plants, animals, ancestors, dwellings, and many other objects via ritual and symbolism. The marked human–animal symbolism, with an emphasis on wild and "dangerous" animals, may perhaps be explained as a conscious attempt to integrate the ancient, deeply rooted, hunting-gathering way of life into new (developing) socioeconomic contexts.

Contrary to Cauvin's "revolution of symbols" and "transformation of the mind" in the earliest Neolithic, it now seems more fitting to speak about (co-)evolution of mind, symbols, subsistence and life in general. Instead of the "Neolithic Revolution", many researchers now agree that Early Holocene developments are part of a long-term process of continuity with gradual rather than dramatic changes (Helmer *et al*., 2004; Hodder, 2003; Tchernov, 1998).

The more general observation that can be drawn from all this is that the formerly presumed strict divisions between the Pre-Pottery and the Pottery Neolithic need revision. Due to much recent research and publications, our understanding of the Neolithic is rapidly changing. Beyond their use

as general chronological and cultural indicators, our traditional cultural–historical boundaries prove to be problematic in many instances. Indeed, as I have argued, it is questionable whether the PPNA is Neolithic in the classical sense. In general, the picture that now emerges is one of long-term continuities on the one hand and regional differentiation on the other. This is only to be expected, as they were set up a long time ago. Having to adjust the old established frameworks is often frustrating and confusing, but I think that first and foremost it is very exciting that we are now able to go beyond boundaries!

CONCLUSIONS

Finally, I would like to draw five main conclusions from this paper.

1. The proposed holistic approach has a number of interrelated features which seem to set it apart from other approaches: (a) it is not environmental or culturally deterministic; (b) the domestication of plants and animals (agriculture) is only one—albeit an important one—facet of domestication; (c) the focus is on relations between many entities and the manipulation thereof, not only regarding humans, plants and animals, but also material culture, ancestors, etc.; (d) domestication is not directly linked to control, but rather to manipulation and influence; (e) in accordance with its holistic nature, the model is based on five sets of biological, anthropological and social notions: *holism*, *reciprocity* and *growth*; *ritual*, *symbolism* and *ideology*; *coevolution*, *opportunism* and *intentionality*; *objectification* and *dwelling*; *history* and *process*.
2. Like the nature–culture dichotomy, straightforward dualisms between hunter/gatherers–domesticated people, agriculture–hunting/gathering, environmental–social theories, and so forth seem to blur rather than to enlighten the process of domestication. Domestication was neither a natural nor a cultural process (environmental, social, symbolic, or cognitive): it was related to all of these dimensions in different combinations and scales of magnitude at different regions and times.
3. Domestication was a long-term process, that is revolutionary only in hindsight. The following *growth* stages have been distinguished: *germination* in the Kebaran; *development* in the Early Natufian; *retreat/dormancy* in the Late and Final Natufian; *growth* in the PPNA; *florescence* in the Early and Middle PPNB; further *development* in the Late and Final PPNB/PPNC; *dispersal* in the Pottery Neolithic (Fig. 14).

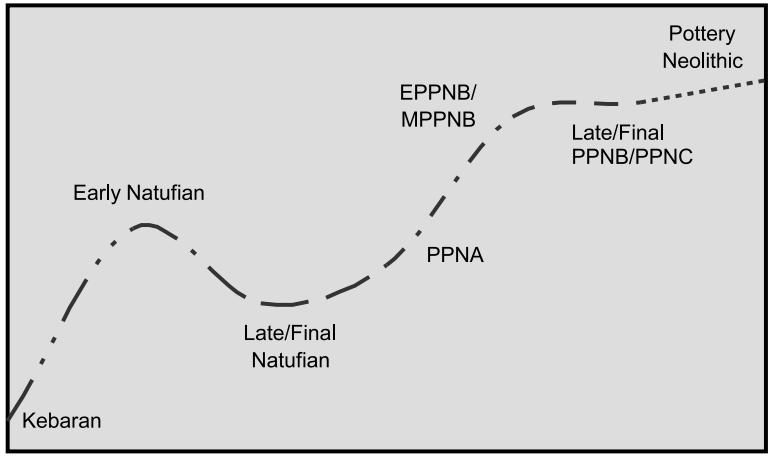


Fig. 14. The process of domestication in the Levant as *growth*: *germination* in the Kebaran; *development* in the Early Natufian; *retreat/dormancy* in the Late and Final Natufian (southern Levant); *growth* in the PPNA; *florescence* in the Early and Middle PPNB; *development* in the Late PPNB; (economic) *dispersal* in the Final PPNB/PPNC and Pottery Neolithic.

4. It can be argued that in the Levantine prehistoric periods discussed, nature and culture were related and linked, rather than distinctly separated, since the analysis has clearly indicated the existence of symbolic and ritual relations between many entities, including ancestors, people, plants and animals. In particular, symbolic human–animal associations and relations between the living and the dead were markedly developed in the Natufian and Pre-Pottery Neolithic periods. Ritual and symbolism were an important means to generate, sustain and change these relations.
5. As the major objective of this paper has been to suggest an alternative approach to the investigation of domestication, rather than an in-depth and complete explanation, the analysis presented has focused more on the *how* than on the *why* question. I suggest that this question is best approached by combining different lines of evidence. Many theories, including the holistic approach presented here, are general, dealing with general patterns, large or huge areas, and long time periods. While I believe that indeed the search for "meta-dimensions" of domestication in the Levant is important, given the evident existence of commonalities in practice and culture of the relevant societies, it is also necessary to counterbalance these models with more local and contextualized data. Different

communities may have reacted differently to similar circumstances. Domestication must have been a complex and multi-faceted phenomenon with different rhythms and intensities in different times and regions. Gebel (2004, p. 28) speaks in this respect about "polycentric evolution," and Henry (1989, p. 10) about a "multilineal view of cultural evolution." We should also recall the geographically independent domestication events for different plant species suggested by Willcox (2002). Detailed contextual analyses should focus on regional and local evidence of the process of domestication, dealing with the *when*, and particularly *how* and *why* questions, while using the general models. These models may be then substantiated, changed or rejected. It is conceivable that some models work better for some contexts than others: as already indicated, most likely *the* model simply does not exist. In a dialectic and hermeneutic manner, different levels of analysis may generate a better understanding of domestication on a supra-regional, regional, and local scale.

ACKNOWLEDGMENTS

First of all, I am indebted to numerous scholars—many but by far not all cited in the text—from both the "natural" and "social" sciences whose work provided the intellectual stimulus for this paper. Clearly, without their research and publications the present paper would not have been possible. I would also like to express my gratitude to Anna Belfer-Cohen, Nigel Goring-Morris and Ian Kuijt, who kindly provided important information. The critical comments of two anonymous reviewers on the initial draft of this paper made me rethink my rethinking, which considerably improved the analysis. I would furthermore like to thank Yoshi Nishiaki and other staff-members of the University Museum of the University of Tokyo, for providing the context (in many senses) for my research. Mikko Kriek produced the drawings. Ans Bulles carefully corrected the English text. My dear Sofie Debruyne helped with the translation of some French papers. Angela E. Close is thanked for her editorial guidance.

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