Available online at www.sciencedirect.com
SCIENCE DIRECT®
C. R. Palevol 5 (2006) 395–404
COMPTES RENDUS PALEVOL
http://france.elsevier.com/direct/PALEVO/

Human Palaeontology and Prehistory

# Inception of agriculture and rearing in the Middle East

Colin Renfrew

*McDonald Institute for Archaeological Research, Downing Street, Cambridge CB2 3ER, UK*

Received 8 November 2004; accepted after revision 13 October 2005
Available online 28 November 2005
Written on invitation of the Editorial Board

**Abstract**

The significance accorded by various scholars to the inception of food production (agriculture and stock rearing) in the Middle East is discussed. It has generally been associated with the development of permanent village settlement, although it is now clear that sedentism preceded the domestication of plants and then of animals. The role of climatic change is considered, and the cultural sequence and its accompanying symbolic revolution are reviewed. The extent of early interaction throughout the Middle East, as documented by obsidian analysis is discussed. The new economy proved an expansive one, lying the foundations for the Neolithic Revolution in the Middle East, Egypt, northern India and Europe, and thus ultimately for the succeeding Urban Revolution. ***To cite this article: C. Renfrew, C. R. Palevol 5 (2006)***.


**Résumé**

**Naissance de l'agriculture et de l'élevage au Proche-Orient.** Nous discuterons ici l'importance accordée au Proche-Orient par plusieurs chercheurs académiques. Cette production a été généralement associée au développement permanent d'établissements de villages, bien qu'il soit clair maintenant que ces groupes sédentaires ont précédé la domestication des plantes et, plus tard, des animaux. Nous tiendrons compte du changement de climat ainsi que de la séquence culturelle ; nous réviserons également la révolution symbolique qui a accompagné ces changements. Nous discuterons les premiers échanges à travers le Proche-Orient tels qu'ils sont représentés par l'analyse de l'obsidienne. Ce fut une économie expansive qui a été à l'origine de la révolution néolithique au Proche-Orient, en Égypte, en Inde du Nord et en Europe, et ceci a, en fin de compte, provoqué la révolution urbaine qui s'en est suivi. ***Pour citer cet article : C. Renfrew, C. R. Palevol 5 (2006)***.


*Keywords:* Agriculture; Sedentism; Middle East; Symbols; Deities; Obsidian

*Mots-clés :* Agriculture ; Sédentisme ; Proche-Orient ; Symboles ; Divinités ; Climat ; Obsidienne

## 1. Introduction

The question of the origins of crop production and of stock rearing – that is to say of farming – in relation to climatic change has been a matter of debate since the early twentieth century[1]. It was Gordon Childe who introduced the concept of the 'Neolithic Revolution'. He

*E-mail address:* renfrew@mcdonald.cam.ac.uk (C. Renfrew).

[1] I would like to express my gratitude to Mr Henry de Lumley and his colleagues for organising the very informative meeting *Climats, cultures et sociétés aux temps préhistoriques* at the Institut de France and for inviting me to take part in it.

1631-0683/$ - see front matter © 2005 Académie des sciences. Published by Elsevier SAS. All rights reserved.
doi:10.1016/j.crpv.2005.10.012

stressed that it was the population increase which was of revolutionary significance, and that this was based upon the development of food production, accompanied by the emergence of sedentism. He argued also that the driving causal force was climatic change and developed the 'oasis propinquity' explanation, which may be regarded as the first, albeit rather simple, climatic model. It held that increasing desiccation brought wild animals and plants into ever closer relationships, from which symbiosis and ultimately domestication emerged. The 'Neolithic Revolution' was correctly seen as the precursor in the same region (although not the same ecological zone) of the 'Urban Revolution', another demographic increase associated with the earliest developments of urbanism and of state society.

It is worth noting that the term 'Neolithic' itself emerges from the archaeological record of northern Europe where the contrast between chipped stone (typical for the Palaeolithic) and polished stone (appropriate to the stone axes of the Neolithic) is particularly marked. German archaeologists later developed the term 'Keramikum', referring to the Neolithic as the phase when pottery production is first seen. But the excavations of Garstang and then of Kenyon at Jericho later revealed 'Neolithic' strata – i.e. strata with traces of domesticated plants and animals – where pottery had not yet come into production. These were the Pre-Pottery Neolithic A and Pre-Pottery Neolithic B of the Levant. And it is only over the past two decades that it has become clear that sedentism preceded food production in the Middle East. All these terminologies are therefore to be employed with some care. It may be noted that similar problems are faced in the archaeology of the Americas, where the term 'Neolithic' is not used. The relevant phase of early food production is often termed 'Formative', which at least has the merits of being satisfyingly imprecise in its meaning.

Since the Second World War the problems of Neolithic origins have been addressed by several archaeological teams. Indeed these questions have been among the most intensively investigated archaeological projects in the world. Although the work of the different research teams from different countries have not been in any sense coordinated, their focus upon comparable objectives has made this one of the best researched of archaeological topics. It may be added that the research focus in the Middle East has been paralleled by comparable projects in Mesoamerica, in China and in other parts of the world.

The ecological approach was systematically applied by Robert Braidwood and his colleagues in their project in Iraqi Kurdistan, which focussed upon the early Neolithic settlement of Jarmo. Shortly afterwards Kathleen Kenyon resumed the excavations at Jericho, and when radiocarbon dating could be applied it became clear that food production in the Levant (e.g. Jericho) emerged notably earlier than in the Zagros area (e.g., Jarmo). Braidwood focussed upon the plant and animal residues, aided in particular by Hans Helbaek, and the application of flotation techniques of recovery became important. He was interested in climatic change and palynologists including W. van Zeist initiated systematic pollen work at suitable sites, notably Lake Zeribar.

Theoretical questions were raised in a challenging way by Lewis Binford, in his 'Post Pleistocene adaptations' paper [5]. He argued that sea-level changes at the end of the Pleistocene led to reduction in coastal plains and resulting demographic pressures, with increasing reliance upon migratory fowl and anadromous fish and increasing reliance upon the stands of wild cereals found in the Levant. Binford sought to develop a causal explanation in which climatic and demographic factors played the principal role.

Barbara Bender [4] moved away from a purely ecological perspective in stressing that social factors may have had a role in the move towards food production. She argued that periodic group meetings, with accompanying feasting, may have required the effective management of food resources, favouring the exploitation of the wild cereals so abundantly found in some parts of the region. It is however to Jacques Cauvin that we owe a perspective which emphasises the symbolic and cognitive aspects of this revolution. His book *Naissance des divinités, naissance des dieux* [6,7] offers a synthesis which is less ecological and less determinist, and in which the role of climate is not greatly emphasised.

## 2. Significance of the transformation

To illustrate the fundamental rupture between the mobile world of the hunter-gatherer of the Upper Palaeolithic period and the sedentary life of the early farmers I would like to quote the well-known example of Çatalhöyük, the early farming site of the eighth millennium BC[2] in the Konya Plain of Turkey. A general view of James Mellaart's excavations [14 (plates 3 and 4)] gives an intense impression of materiality. The solid substance of the unbaked mudbricks which constituted

[2] Dates in this article are given in calendar years (based upon the calibrated radiocarbon timescale).

the walls of the settlement suggests that humans are now inhabiting a new material world that they themselves have created. The contrast with the flimsy dwellings of the mobile hunter-gatherers of the preceding Upper Palaeolithic period is very marked. It suggests a new and different kind of material engagement between humans and the material world, in which the opportunity is made for new social relationships between humans in this large settlement. The point is underlined when one notes the large number of rooms where there are symbolic representations, often involving bull's heads. In these social spaces the shape of the space is no longer determined by the natural shape of the cave of the preceding era. Now the dimensions are governed by the exigencies of the relationship between humans and the materials they are using – the mud for the walls, the wood for the roofing beams. There were indeed mural decorations, of painting on plaster, at this time. But there is also a wider range of symbolic forms.

Burial with grave goods was indeed practised during the Upper Palaeolithic period. Now however there are clearer indications of social standing, indicated for instance by knives and daggers of obsidian. In particular the mirror of obsidian sometimes included with the deceased may be seen as a symbol of self-awareness, indeed a veritable materialisation of reflexivity and of reflexive thought.

As noted above, Jacques Cauvin has written of 'deities' at this time. I am not at all certain, however, that the female statuettes of terracotta which are found can really be regarded as representations of a 'goddess'. Indeed I note the view of Jean Perrot that it is premature to talk of a 'religion' in the Neolithic period. And yet at the same time, when we find a clay statuette of an imposing female person who sits flanked by a pair of feline animals, we have perhaps to recognise that this imagery goes beyond what one might expect to encounter in everyday life.

Let us note also that at this site fragments of cloth have been found, made of flax. We are in face of a whole series of new technical avenues, without even speaking of pottery which was by now coming into use.

## 3. The sapient paradox

This fundamental transformation, so well documented by a number of imposing Neolithic sites in the Middle East, including Jericho, is the result of sedentism soon allied to food production – to agriculture and animal husbandry. Yet for me there is a paradox here, which I call 'the sapient paradox'. How is it that our species took so long to bring these things about? Formed in Africa more than 100 000 years ago; dispersing out of Africa at least 60 000 years ago, and well established in Europe and much of the rest of the world by 40 000 years ago, why did it take *Homo sapiens sapiens* another 30 000 years to bring about this major transition?

It is generally asserted that the 'human revolution' was complete by 40 000 years ago. Our own species had emerged, the special lithic industries (notably blade industries) and other cultural indicators emphasised by archaeologists were in place in Europe by then, along with other behavioural indicators. That the genetic composition of these members of our species was closely similar to our own now seems rather well established. It is thus a major challenge to understand just where the major transition we are discussing- the emergence of sedentism - took place, and why, after the 'human revolution' accompanying the appearance of our own species, it took so long coming.

## 4. Where

At least, if the timing of this transition requires further investigation, its location is becoming better understood. The main ingredients of the farming package that emerged in the Middle East and that were later carried to Europe were: barley; wheat, specifically emmer wheat, *Triticum dicoccum*, and einkorn, *Triticum monococcum*, to which must be added the main pulse crops, notably lentils, peas and vetch, which are rich in protein. Various scholars have plotted the modern distributions of the wild progenitors of these species along what Braidwood used to call 'the hilly flanks of the fertile crescent'.

The maps make clear that in general the wild crops, for instance wild barley (*Hordeum spontaneum*) – see Fig. 1 – were available along the lands bordering the Levant coast and further inland – the so-called Levantine corridor – and north into northern Syria and southeastern Turkey as well as along the flanks of the Zagros Mountains. In some cases, notably that of einkorn, the distribution extends further into central Turkey, on the slopes of the Taurus Mountains [11].

Distribution maps for the two principal animal species involved, the sheep and its wild ancestor, the mouflon, and the goat and its ancestor the bezoar, show similar distributions. Cattle, which were also domesticated at an early stage, have a broader wild habitat extending into Turkey and Europe. The archaeological record in the Middle East now makes clear that the

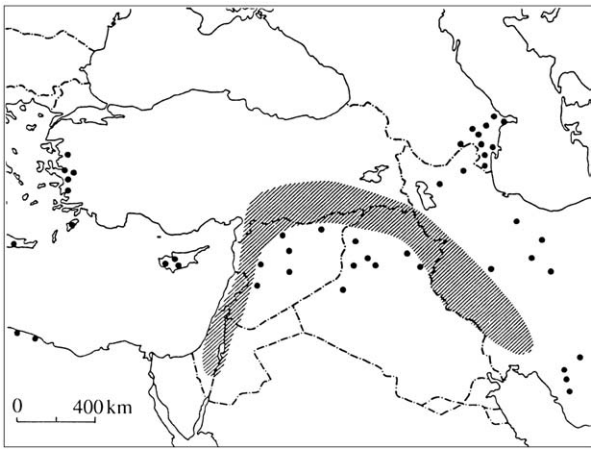


Fig. 1. The modern distribution of wild barley, *Hordeum spontaneum*, giving an indication of the region in which its domestication must have taken place at the onset of the Neolithic (after [22]).
Fig. 1. Distribution moderne de l'orge sauvage, *Hordeum spontaneum*, donnant une indication quant à la région dans laquelle la domestication de l'orge aurait dû se produire au commencement de la période néolithique.

relevant plants were domesticated some time before the animals, and so it is upon the plants that one must first concentrate. It may be significant that recent genetic work on the origins of einkorn and its wild progenitor indicate quite a limited area of origin in southeastern Turkey on the slopes of the eastern Taurus Mountains

Early farming, using the same assemblage of plants and of animals is also seen along the western flanks of the Zagros Mountains of Iraq and Iran [13]. But it is now clear that the early Neolithic at sites like Jarmo in Iraqi Kurdistan and at Ali Kosh in the Deh Luran area of Iran are not as early as the earliest farming sites in the Levant. In the Zagros area food production makes its appearance rather later, around 8000BC during what, in Levantine terms, would be Pre-Pottery Neolithic B.

## 5. Climatic change

The climatic picture for the crucial time period following the Last Glacial Maximum (ca. 20 000 to 16 500 BC) is obtained from pollen sequences in the area, notably Lake Zeribar, through the work of Van Zeist and his colleagues, as well as from oxygen-isotope analyses from Mediterranean deep-sea cores, and more recently from ice cores from the northern circumpolar ice. They indicate significant warming at the end of the last ice age during the warm Bölling and Alleröd climatic oscillations, from about 16500 to 12500 BC, with accompanying increase in rainfall. There was, however, a marked decrease in rainfall during the cold period known as the Younger Dryas, from about 11000 to 9500 BC. Following this, however, warmer conditions were resumed, with the inception of the Early Holocene period around 9500 BC.

If one were to take a position of climatic determinism one might argue that the appropriate ecological conditions for the intensive exploitation of large stands of cereals were not available until the sustained warmer climate which accompanied the end of the Pleistocene and the beginning of the Holocene around 9500 BC. This would then 'explain' the timing of the 'Neolithic Revolution'. But this would not be entirely satisfactory, for several reasons. For, in the first place, as we shall see, the sedentism of the Natoufian culture, which preceded the intensive exploitation of cereals and which seems to have led to their domestication and cultivation, took place earlier, during the Bölling/Alleröd climatic oscillation or warm spell between 12500 and 10000 BC.

More significantly, however, this was not the first such warm spell, and there were several earlier warm spells or 'interstadials' during the Upper Palaeolithic period.

However, the Greenland ice cores (Fig. 2) offer a further insight. Their high chronological definition allows one to note the frequency of the climatic oscillations taking place throughout the Upper Palaeolithic. These sometimes quite rapid changes in temperature must have posed serious problems for the human populations of the time [3], and the key factor in the ensuing Early Holocene may have been an increased stability as much as the warmer temperatures themselves.

The 'Grip Summit' ice core from Greenland (Fig. 2) show clearly the rapid warming at the onset of the Bölling oscillation, starting around 12500 BC (i.e. 14500 BP), and then the marked and prolonged cold spell of the Younger Dryas from ca. 11000 to 9500 BC (13000 to 11500 BP). This was followed by the pronounced warming and then sustained warm weather following the inception of the Early Holocene. The ice core evidence also makes clear how severe and sometimes how rapid were the climatic fluctuations over the preceding 150000 years, a period that covers the entire time span of our species.

## 6. Early sedentism

### 6.1. The Natufian

The first indications of what may be regarded as sedentism have been recognised in the Natufian culture

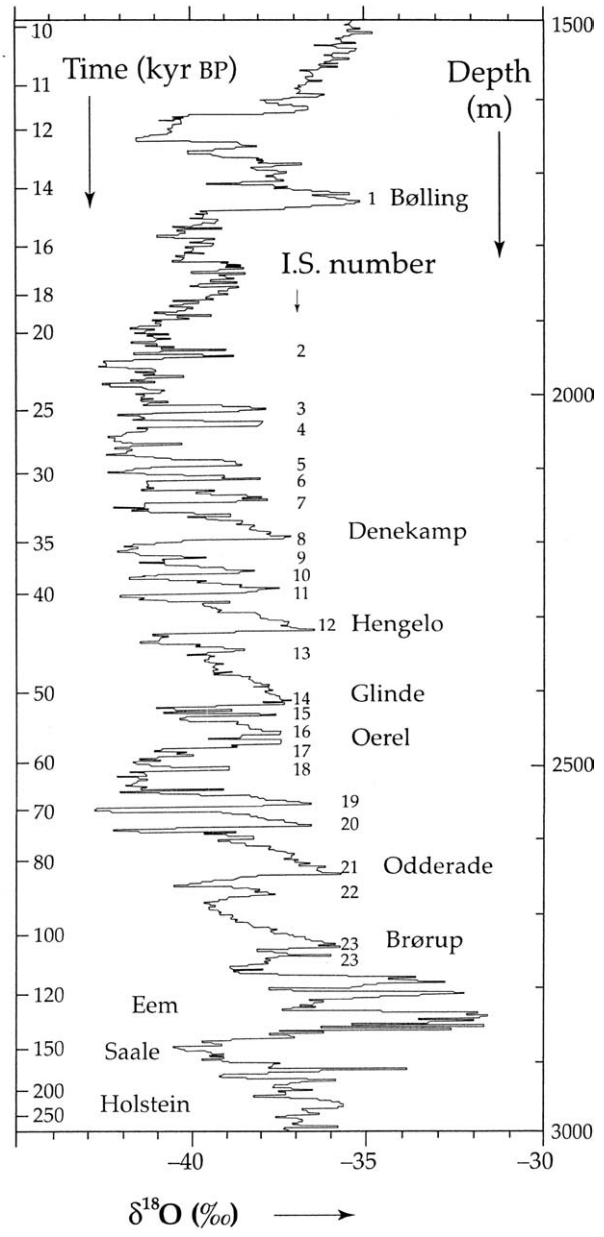


Fig. 2. Climatic fluctuations during the last glaciation and Early Holocene as reflected in oxygen isotope ratios in the 'Grip Summit' ice core from Greenland. Showing increases in temperature (to the right) or decreases (to the left) of up to 7 °C. Note that the timescale, based partly upon the calibrated radiocarbon chronology, is shown in thousands of years BP (Before Present) (after [9,15]).

Fig. 2. Fluctuations climatiques pendant la glaciation finale et à l'époque Holocène ancien, indiquées par les indices isotopiques de l'oxygène dans la carotte de glace 'Grip Summit' du Groenland. Les accroissements (vers la droite) et les diminutions (vers la gauche) de température jusqu'à un changement de 7 °C sont indiqués. L'échelle du temps, basée sur les datations calibrées du radiocarbone est donnée en milliers d'années BP (avant le présent). (D'après [9,15]).

of the Levant, today dated from between 12500 and 10000 BC (Fig. 3). First recognised more than 70 years ago by Dorothy Garrod, the Natufian culture became better understood through the work in the 1950s of Jean Perrot at the site of Eynan (Ain Mallaha). There it is appropriate to speak of a village, with houses of circular plan. The settlement may be considered pre-agricultural. Although wild cereals were indeed exploited, this was not the principal basis of subsistence. It is possible to speak here of 'broad spectrum exploitation', where a wide range of species was utilised, both plant and animal, without the specialisation which later becomes a feature of agricultural societies. Natufian burials contain ornaments of shell and polished stone.

At around the same period, in the middle reaches of the Euphrates River in Syria, wild cereals were gathered by the inhabitants of the village at Abu Hureyra and at Mureybet.

### 6.2. The Khiamian phase

On current evidence, it would seem that the development of intentional cultivation can be placed late in the cold Younger Dryas period, around 9700 BC. Jacques Cauvin [7 (p. 22)] has distinguished an episode, from ca. 10000 to ca. 9500 BC, during which the first indications of cereal cultivation are found, along with what he terms the 'revolution in symbols'. During the Younger Dryas, the sedentary hunter-gatherer societies of the Early Natufian became more mobile and more dispersed. Bar-Yosef [2 (p. 116)] suggests that greater mobility during the Late Natufian is indicated by the disappearance of decorated burials and the larger number of multi-individual graves. Towards the end of the Younger Dryas, however, one response in the Middle Euphrates was the beginning of cultivation, seen at Mureybet and Abu Hureyra [12]. It is at this time, as Cauvin emphasises, that female figurines are now regularly found, for instance at El Khiam and at Mureybet, and bull crania, complete with their horns were buried inside houses at Mureybet.

### 6.3. Pre-Pottery Neolithic A

By about 9500 BC, it is possible to speak of the first agricultural economy with settled farming life, based upon the cultivation of cereals and of pulses, established in what may be termed the Levantine Corridor (Fig. 4), in a zone extending from sites in southern Jordan and Israel in the south to the Middle Euphrates

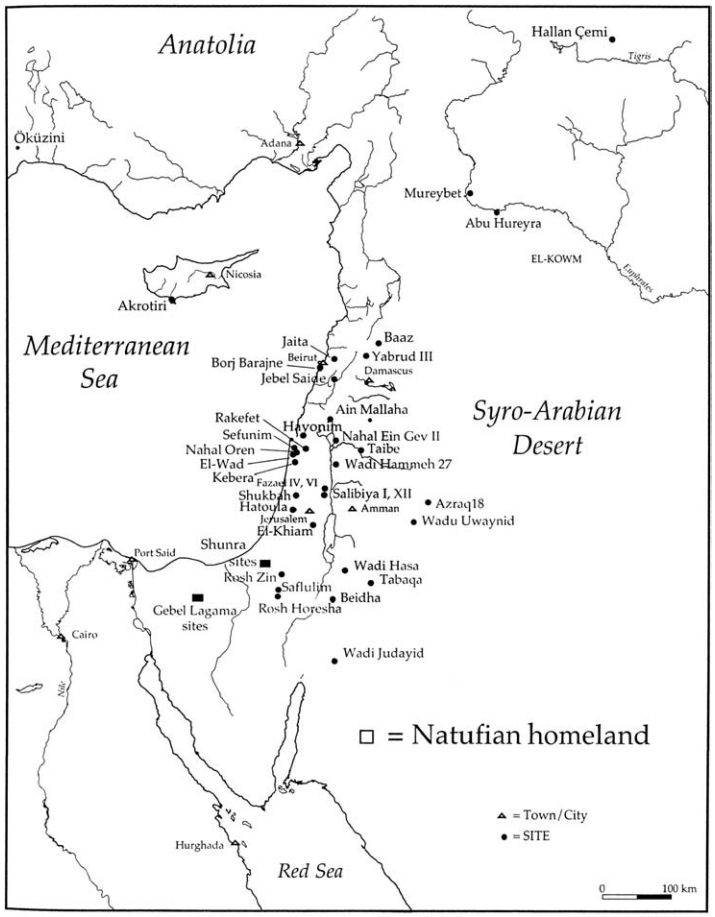


Fig. 3. Distribution of the Natufian culture in the period from ca. 12500 to 10000 BC (after [2]).
Fig 3. Distribution de la culture natoufienne pendant la période ca.12.500 à 10.000 ans avant notre ère (D'après [2]).

(northern Syria and southeastern Turkey) in the north. The Pre-Pottery Neolithic A phase is dated from ca. 9500 to ca. 8800 BC.

One of the first sites to be explored was Jericho, where the excavations of Kathleen Kenyon revealed an extensive Pre-Pottery Neolithic A town, built over the remains of earlier Natoufian occupation. The walls and tower at Jericho may or may not have had a defensive purpose, but they are certainly the product of community activity. Settlements at this period vary in size from 0.2 to 2.5 ha. The first rectangular structures are found in the middle Euphrates area at this time, notably at Mureybet. What may have been a communal building was excavated at Mureybet IIIA, and an open space at Çayönü has been interpreted as a 'plaza' for public and ritual gatherings [16]. At Jericho, skulls were sometimes separately inhumed.

### 6.4. Pre-Pottery Neolithic B

At Jericho, there was a cultural transition around 8700 BC, leading to a new cultural phase designated Pre-Pottery Neolithic B, which lasted until the development of pottery around 7000 BC. This may be regarded as an age of transformation in the exploitation of animal resources, for it was at this time that the husbandry of domesticated sheep and goats began, and by the end of the period, ca. 7000 BC, domesticated cattle and pigs are also found. During this time also the earliest farming settlements yet known are found in central Anatolia, at Asıkli Hüyük, and later at Çatalhöyük.

Several developments in ritual are very striking at this time, although they may have their origins in the preceding phase. In the first place, there developed what may be termed a 'skull cult', where skulls were

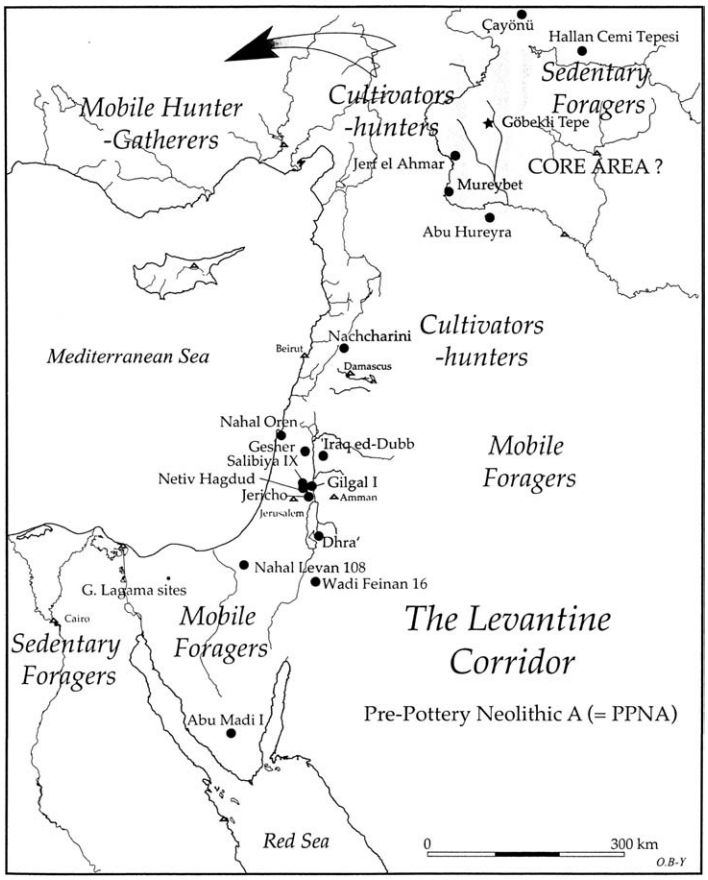


Fig. 4. Main sites in the Levant during the Pre-Pottery Neolithic A period, from ca. 9500 to 8800 BC (after [2]).
Fig. 4. Principaux chantiers archéologiques au Levant pendant la période Néolithique précéramique A, environ 9500 à 8800 ans avant notre ère. (D'après [2]).

removed from the body and buried, often together in small groups. At Jericho the faces of the deceased were sometimes modelled in plaster onto the skull. At Çayönü in southeastern Anatolia more than seventy human skulls were found together in a special building, inside small chest-shaped cells, sealed by large flat slabs. A sanctuary also existed at Nevali Çori, likewise in southeastern Anatolia. In the same region, at Göbekli Tepe, a sanctuary had large upright stones on which animals were carved in relief. Stone masks have been found from this period in Israel, and at Ain Ghazal in Jordan a group of plaster statues, up to 90 cm in height.

In central Anatolia, the site of Çatalhöyük was founded around 7500 BC, lasting to around 6400 BC. As noted earlier, it was a large settlement, occupying an area of 12 ha constructed on the agglutinative plan of adjoining houses without intervening alleyways. Many rooms have been identified as 'shrines', with mural paintings, bull crania and a repertoire of clay figurines, both animal and human, which have led some writers to speak of a fertility cult and of veneration for a 'mother goddess'.

## 7. Interactions

A remarkable insight into the interactions between the different local areas in the Middle East considered here is offered by the trade in obsidian, the volcanic glass used in prehistoric times to make chipped stone implements (Fig. 5). In this region there are only a few sources of obsidian that are relevant: two in Central Anatolia (Cappadocia) and two in eastern Anatolia, at Nemrut Dag and Bingöl. There are indeed further sources to the north but they are not greatly relevant to the region we are considering. Early work by trace element analysis [21,20] was able to distinguish between the products of the different sources and so to sketch the outlines of the relevant trading patterns. This work has been refined and indeed superceded through the more recent work of Marie-Claire Cauvin and her

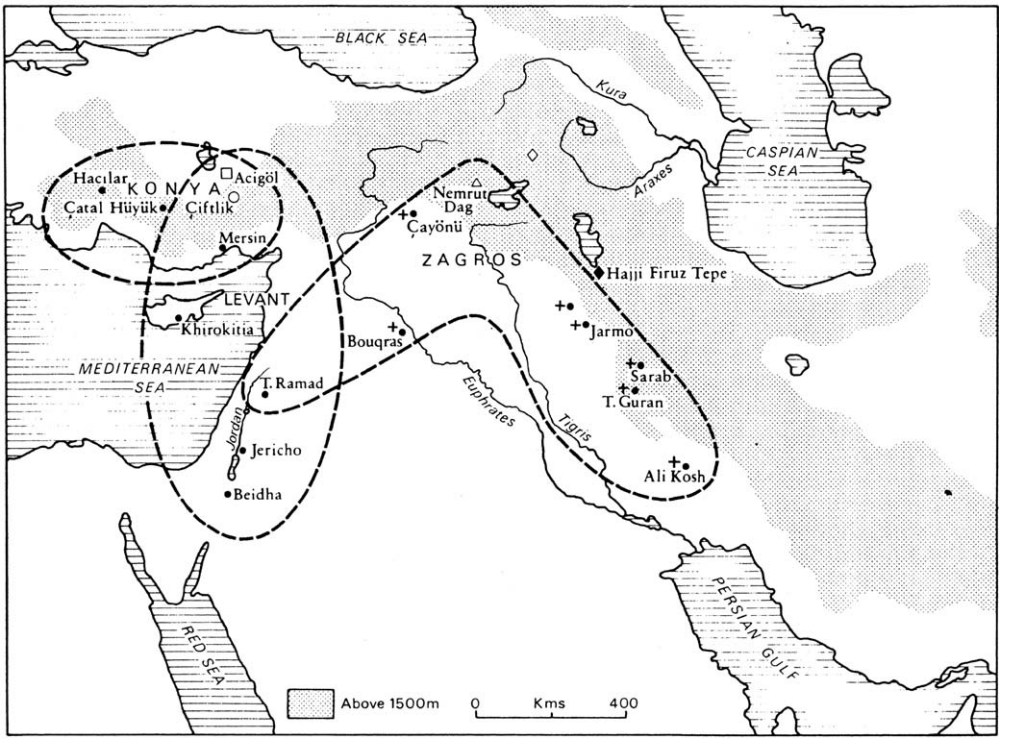


Fig. 5. The early trade in obsidian from its sources in central and eastern Anatolia, ca. 9000 to 6000 BC (after [20]). In the Levant zone, the obsidian is predominantly from the Göllü Dag East source formerly designated Çiftlik, in the Konya area from the Nenezidag source, formerly designated Acigöl. In the Zagros zone the obsidian is from Nemrut Dag and from Bingöl (indicated by a cross).
Fig. 5 L'échange d'obsidienne en provenance des sources d' Anatolie centrale et de l'Est, environ 9000 à 6000 ans avant notre ère (D'après [20]). Dans la zone levantine, l'obsidienne était obtenue principalement de Göllü Dag Est, autrefois appelée Çiftlik. Dans la zone de Konya, elle provenait de Nenezidag, autrefois Acigöl. Dans la zone Zagros, l'obsidienne provenait de Nemrut Dag et aussi de Bingöl (indiqué par une croix).

colleagues [8] while the broad conclusions established earlier remain valid in outline.

In the Levant, obsidian from the source in Cappadocia formerly termed Çiftlik and now designated Göllü Dag East [8], is found from the time of the earliest sedentism, although it is rare in Natufian sites, becoming a little more frequent in Pre-Pottery Neolithic A Jericho, and found much more widely and abundantly in sites of the Pre-Pottery Neolithic B period. It is notable too that obsidian from eastern Anatolia (the sources of both Nemrut Dag and Bingöl was reaching sites in the middle Euphrates and the eastern Taurus (Çayönü) during and in some cases before the Pre-Pottery Neolithic A period, from about 9000 BC. This indicates clearly that the different areas of our region already enjoyed some measure of interaction at these early times, contacts whose significance no doubt extended far beyond the matter of obsidian. For Central Anatolia the matter is doubly suggestive since Cappadocia has not yet given indications of settlement in the early period contemporary with the Natoufian, Khiamian or Pre-Pottery Neolithic A of the Levant. It is possible that there were hunter-gatherers in Cappadocia who enjoyed an exchange relationship with their contemporaries in the Levant at this early time. But there remains the possibility that sedentary settlements will yet be discovered in Central Anatolia earlier than the earliest at present known at Asilklı Hüyük. We have clearly much yet to learn about the origins of sedentism in Anatolia.

## 8. The diffusion of the farming economy (Fig. 6)

What Jacques Cauvin called the 'Great Exodus', namely the spread of farming, took place from around 8000 BC. The farming economy proved an expansive one, but the term 'Exodus', may be misleading, since it is not necessary to assume any long distance movements of individual farmers. As we have noted above, settlements (whether sedentary or mobile) contemporary with the Levantine Natoufian and Pre-Pottery Neolithic A (12500 to 8000 BC) have not yet been discovered in Anatolia, where the record begins in effect with the well developed village with rectangular houses of

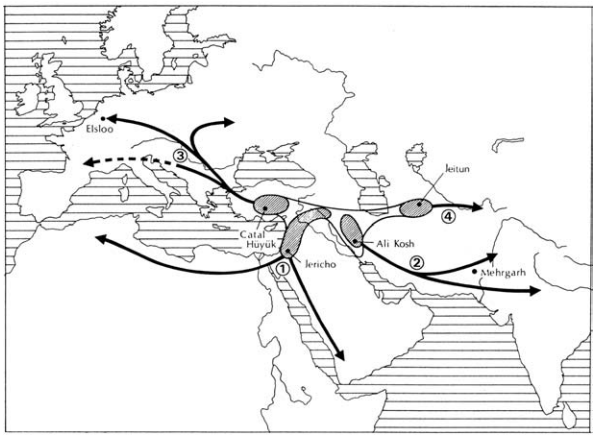


Fig. 6. The expansion of elements of the farming economy of the Middle East to Europe, North Africa, the Indian sub-continent, and Turkmenia. In some cases, the spread of the economy may have been accompanied by the transmission of the relevant local language: (**1**) Proto-Afroasiatic from the Levant to North Africa, (**2**) Proto-Elamo-Dravidian from the Zagros to Pakistan, and (**3**) Proto-Indo-European from Central Anatolia to Europe (after [18]).

Fig. 6. L'expansion des éléments de l'économie agricole (depuis le Proche-Orient) vers l'Europe, l'Afrique du Nord, les Indes et la Turkménie. Dans certains cas, cette expansion économique aurait pu être accompagnée par la dispersion de l'actuelle langue locale, notamment (**1**) le proto-afroasiatique, du Levant jusqu'à l'Afrique du Nord, (**2**) le proto-élamo-dravidien, de la région de Zagros au Pakistan, et (**3**) le proto-indo-européen de l'Anatolie centrale jusqu'à l'Europe (D'après [18]).

Asıkli Hüyük around 8000 BC. But it would not surprise me if local antecedents were yet found in Anatolia, taking sedentary life and perhaps food production back earlier than this.

Already around 9000 BC traces of human activity are found in Cyprus, although these settlers did not yet have plant or animal domesticates. However at the site of Schilouorokambos there are clear indications from ca. 7600 BC of settlements based on cereal agriculture as well as on the herding of sheep and goats, and of cattle.

We have seen, from the evidence of obsidian, that various areas of the Middle East were in communication from very early times. It is therefore not necessary to think in terms of regional isolation, but perhaps rather of adjoining areas interacting with each other, although developing in their own way and at their own pace. That is particularly the case for areas within the natural habitats of the wild ancestors of the future plant and animal domesticates.

The situation was, however, a very different one for the outlying areas: of Europe to the north-west, of North Africa to the south-west, of the Indian sub-continent to the south-east and of Turkmenia to the north-east. In Europe it is clear that the entire Levantine farming package was transmitted from Anatolia to Greece and then on to the Balkans and the West Mediterranean from around 7, 000 BC. It seems likely that the initial spread involved some localised movements of farmers as population densities increased, following the 'wave of advance' model of Ammerman and Cavalli-Sforza [1]. The role of the pre-existing hunter-gatherer populations should not, however, be underestimated, and it is possible that in western and northern Europe the farming economy was first acquired by a process of acculturation. The site of Mehrgarh in Pakistan clearly suggests that the Levantine package of plant corps was an imported one, although there is a stronger case there for local animal domestication. In North Africa the sheep and goat as well as the wheat and barley which came to be cultivated seem to have a Levantine origin. The same may be the case for Turkmenia and indeed for the Iranian plateau.

The possibility has been advanced that the distribution of the Indo-European family of languages in Europe may be due to such a process, with the homeland of the Proto-Indo-European language situated in the Neolithic of central Anatolia [17]. Comparable application of the farming/language dispersal hypothesis [18,19] might explain the distribution of the Afroasiatic language family and perhaps other language families also. Yet while this linguistic proposal remains hypothetical, the impact of the farming economy, based upon the use of plant and animal species which were first domesticated in the Middle East, can scarcely be disputed.

## 9. Conclusion

This discussion has focussed upon the origins of agriculture and stock rearing in the Middle East, which provided the necessary plant and animal domesticates for the later development of farming in Europe, in the Eurasian steppes, in Egypt and North Africa and in the northern Indian sub-continent [10]. A comparable survey would be possible for the other centres of early cultivation in the world: for China (rice and millet), for Mesoamerica (maize and other crops) for South America, for West Africa, and for New Guinea. In each case some of the same questions need to be asked. But it does not follow that in each case that sedentism preceded the domestication of the relevant plant species. Moreover, in most of the other areas mentioned, the economic transition took place at a later date. It is therefore less readily connected with the climatic changes at and preceding the onset of the Early Holocene. This

observation cautions against a purely climatic and demographic explanation for the significant transitions which occurred.

It might be simplistic to take a view which strongly emphasised human symbolic behaviour to the expense of environmental constraints, although the symbolic evidence form the Middle East is indeed impressive. Human agency is not to be ignored in this matter, but nor can it be privileged at the expense of an integrated environmental view. The trouble is that archaeological theory has not yet learnt to integrate the two approaches very effectively.

## References


[1] A.J. Ammerman, L.L. Cavalli-Sforza, The Neolithic Transition and the Genetics of Populations in Europe, Princeton University Press, Princeton, NY, USA, 1984.

[2] O. Bar-Yosef, The Natufian culture and the Early Neolithic: social and economic trends in southwestern Asia, in: P. Bellwood, C. Renfrew (Eds.), Examining the Farming/Language Dispersal Hypothesis, McDonald Institute, Cambridge, 2002, pp. 113–126.

[3] E. Bard, Climate shock: abrupt changes over millennial time scales, Phys. Today 12 (2002) 32–38.

[4] B. Bender, Gatherer-hunter to farmer: a social perspective, World Archaeol. 10 (1978) 204–222.

[5] L.R. Binford, Post-Pleistocene adaptations, in: S.R. Binford, L.R. Binford (Eds.), New Perspectives in Archaeology, Aldine, Chicago, 1968, pp. 313–342.

[6] J. Cauvin, Naissance des divinités, naissance des dieux. La révolution des symboles au Néolithique, CNRS Éditions, Paris, 1994.

[7] J. Cauvin, The birth of the gods and the origins of agriculture, Cambridge University Press, Cambridge, 2000.

[8] M.-C. Cauvin, A. Gourgaud, B. Gratuze, N. Arnaud, G. Poupeau, J.-L. Poidevin, C. Chataigner, in: L'obsidienne au Proche-Orient : du volcan à l'outil, British Archaeological Reports International Series 738, Oxford, UK, 1998.

[9] W. Dansgaard, S.J. Johnsen, H.B. Clausen, D. Dahl-Jensen, N.S. Gundestrup, C.U. Hammer, C.S. Hvidberg, J.P. Steffensen, A.E. Sveinbjornsdottir, J. Jouzel, G. Bond, Evidence for general instability of past climate from a 250-kyr ice record, Nature 364 (1993) 218–220.

[10] The Origins and Spread of Agriculture and Pastoralism, in: D.R. Harris (Ed.), Eurasia, UCL Press, London, 1996.

[11] M. Heun, R. Schäfer-Pregel, D. Klawan, R. Castagna, M. Accerbi, B. Borghi, F. Salamini, Site of einkorn wheat domestication identified by DNA fingerprinting, Science 278 (1997) 1312–1314.

[12] G. Hillman, Late Pleistocene changes in wild plant-foods available to hunter-gatherers of the northern Fertile Crescent: possible preludes to cereal cultivation, in: D.R. Harris (Ed.), The Origins and Spread of Agriculture and Pastoralism in Eurasia, UCL Press, London, 1996, pp. 159–203.

[13] F. Hole, The context of caprine domestication in the Zagros region, in: D.R. Harris (Ed.), The Origins and Spread of Agriculture and Pastoralism in Eurasia, UCL Press, London, 1996, pp. 263–281.

[14] J. Mellaart, Çatal Hüyük, a Neolithic Town in Anatolia, Thames and Hudson, London, 1967.

[15] P. Mellars, Stage 3 climate and the Upper Palaeolithic revolution in Europe: evolutionary perspectives, in: J. Cherry, C. Scarre, S. Shennan (Eds.), Explaining social change studies in honour of Colin Renfrew, McDonald Institute, Cambridge, 2004, pp. 27–44.

[16] A. Özdogan, Çayönü, in: M. Özdogan, N. Basgelen (Eds.), Neolithic in Turkey, Cradle of Civilization, Arkeoloji ve Sanat Yayinlari, Istanbul, 1999, pp. 35–64.

[17] C. Renfrew, Archaeology and Language, the Puzzle of Indo-European Origins, Jonathan Cape, London, 1987.

[18] C. Renfrew, Before Babel, speculations on the origins of linguistic diversity, Camb. Archaeol. J. 1 (1991) 3–23.

[19] C. Renfrew, The 'emerging synthesis': the archaeogenetics of farming/language dispersals and other spread zones, in: P. Bellwood, C. Renfrew (Eds.), Examining the Farming/Language Dispersal Hypothesis, McDonald Institute, Cambridge, 2002, pp. 3–16.

[20] C. Renfrew, J.E. Dixon, Obsidian in Western Asia, a review, in: G. Sieveking, I.H. Longworth, K.E. Wilson (Eds.), Problems in Economic and Social Archaeology, Duckworth, London, 1976, pp. 137–152.

[21] C. Renfrew, J.E. Dixon, J.R. Cann, Obsidian and early cultural contact in the Near East, Proc. Prehist. Soc. 22 (1966) 30–72.

[22] D. Zohary, The founder crops of southwest Asian agriculture, in: D.R. Harris (Ed.), The Origins and Spread of Pastoralism in Eurasia, UCL Press, London, 1966, pp. 142–148.