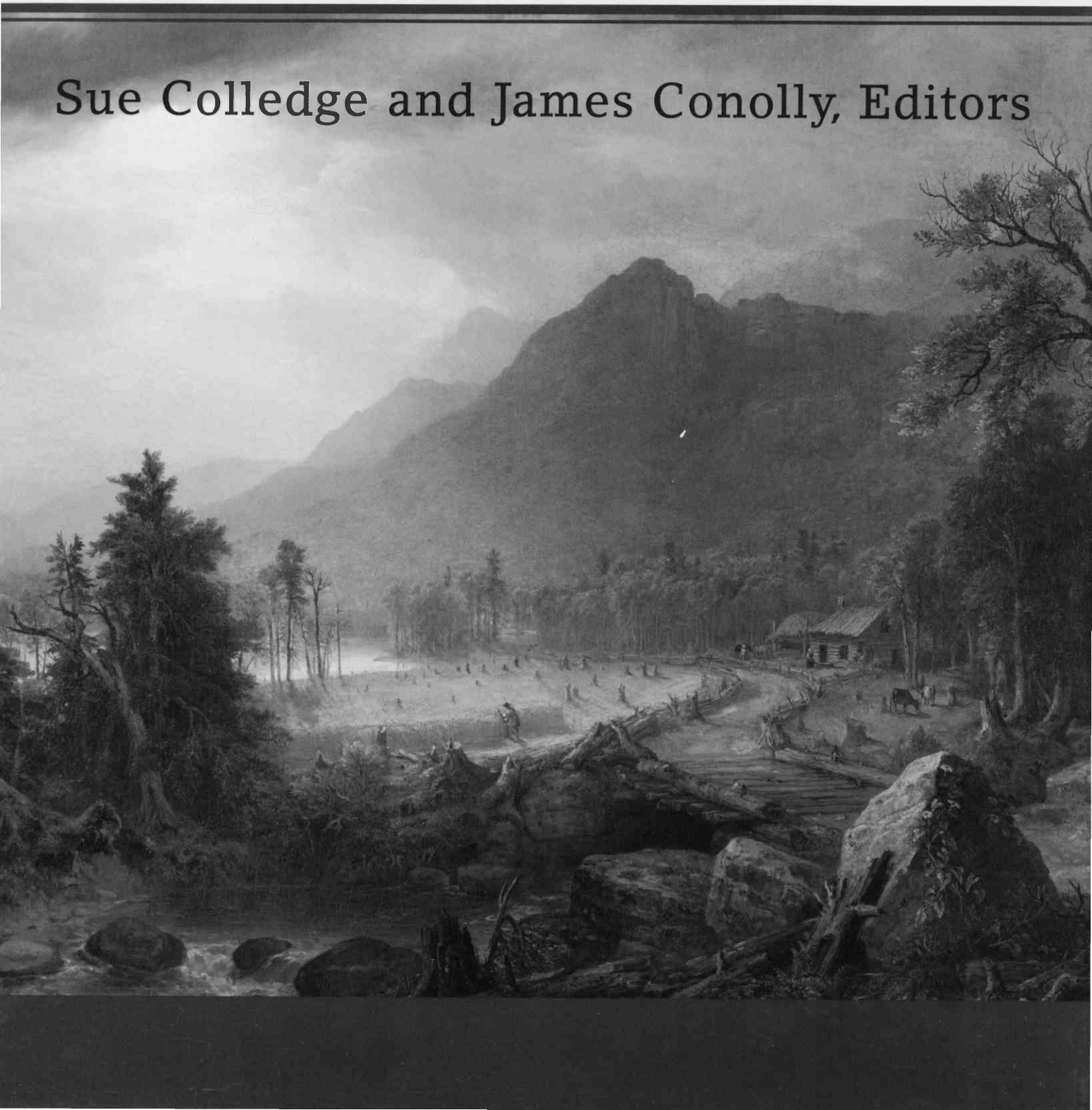
The Origins and Spread of Domestic Plants in Southwest Asia and Europe

Sue Colledge and James Conolly, Editors



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Chapter 1

Diverse origins: regional contributions to the genesis of farming

Andrew Sherratt
University of Sheffield, UK

Editors' note

Andrew Sherratt provided a lively closing address to the December meeting. From his characteristically broad, interregional, perspective he deftly brought together early farming, cultural interaction, exchange and population movement into a coherent and insightful whole. We therefore decided to have his paper open, rather than close, this volume as it provides a fitting introduction to the themes and questions that the subsequent papers engage with at local scales. Tragically, Andrew unexpectedly passed away during the latter stages of our editing of this book. The resultant loss his untimely passing brings cannot be over stated. His great depth of understanding and profound contribution to the study of Neolithic Europe was recognized by all who knew him and his work.

1.1 Introduction

This paper presents an outsider's view of the circumstances which led to the beginning and early spread of farming. It is a personal attempt to come to terms with how this historically momentous set of events came about, in light of the flood of new information which has transformed our knowledge of the subject in the last thirty years.[1] Having struggled to understand it within the changing paradigms of those argumentative decades, I feel that I have at last overcome some of the obstacles created by the language and expectations with which northwest Europeans have traditionally approached it, and which is built into the vocabulary that has been used to describe it. Insofar as this engagement has been motivated by an attempt to grasp its wider significance for prehistory as a whole, it may be a useful complement to the more professional treatment of these issues in the rest of this volume, by authors who know far more about its problems than I do. At any rate, it is motivated by a genuine desire to understand the phenomena and what they mean.

[1] The metaphor is an especially apt one, since much of the information has been retrieved by rescue-excavations in advance of dam-construction, and many of the key sites are now literally flooded.

1.2 'Neolithic': the burden of a name

A characteristic dilemma arises from using a terminology established in one set of circumstances and applying it to another—especially if it has in the meantime been given a global significance. This is the case with our basic vocabulary for dealing with this topic, that of 'neolithic origins'. 'Neolithic' was the term invented, in Northwest Europe (at a time when many neo-Greek technical terms entered the professional vocabulary, in physics and chemistry as much as in archaeology), for the evident contrasts between the earlier and later parts of the Stone Age. Another half-century elapsed before a further term, 'mesolithic', was inserted between them (on the common model of geological sequences, and in the then-fashionable mode of tripartition) to deal with the Holocene foragers who upset the neat dichotomy between Ice Age hunters and more recent stone-using farmers. The terminology achieved only a partial success, in that it was never widely applied in the Americas, and only in a typological sense in much of the rest of Eurasia; but it achieved a whole new level of meaning in Gordon Childe's unification of the language of an emerging archaeological taxonomy with that of comparative ethnography in the Enlightenment tradition, and more specifically in the classification of Lewis Henry Morgan, where pottery and polished stone axes signified the emancipation of 'Barbarism' from 'Savagery' with the appearance of farming (Childe 1936). Thus it was that Grahame Clark, as recently as 1946, could take as the title for a popular account of prehistory 'From Savagery to Civilisation', using a terminology little different from that used by Adam Smith and his contemporaries two hundred years earlier, and decidedly odd-sounding today (Clark 1946). Childe's conflation of the two vocabularies and his equation of the Neolithic with the beginnings of farming was canonized in his term the 'Neolithic Revolution', which (unlike the 'Urban Revolution'—presumably because the term 'Agricultural/Agrarian Revolution' had already been bagged by historians describing how England adopted the turnip and the Brussels sprout at the time of her eighteenth century industrialization) used an artifactual label to designate this major prehistoric change in subsistence practices. This led to inconsistencies on two levels: at a global level, where 'neolithic' continued to be used for foraging societies using pottery and polished stone axes, and at a local level as observations accumulated in Western Asia (the 'Near East' in our Eurocentric terminology) about the early village communities of that region. Hence the shock to uniformitarian expectations when Kathleen Kenyon discovered a 'Pre-Pottery Neolithic' (PPN) phase at Jericho, and Robert Braidwood an 'aceramic neolithic' phase at Jarmo—the former divided by Kenyon into A and B, and subsequently used as the basis for Levantine periodizations of the early Holocene. This has given rise to further subdivision and the emergence of such off-putting algebra as 'EPPNB' or even 'early MPPNB' (which, to make matters worse, is actually the same period in the hands of different authors). Even more confusingly, the term PPNA is used to cover both farming and foraging communities, existing contemporaneously and using the same arrowhead-types, but differing fundamentally in their modes of subsistence. Yet in fact the terminological situation is worse even than this, because of the appearance and disappearance in Western Asia of the term 'mesolithic', which was first applied by Dorothy Garrod (1957) to the Natufian, but then fell into disuse when it became evident that this group of foragers belonged to the terminal Pleistocene, and thus (on a European definition, limiting mesolithic cultures to the post-glacial) formally speaking belonging to the Palaeolithic. The creation of a special term, 'Epipalaeolithic', left them as a pendant afterthought to the older stone age, without any individuality as a historical phenomenon—unless some of them were honorifically described as 'neolithic', too. (The alternative terminology, arising from Robert Braidwood's work, 'incipient farmers', had the opposite fault—characterizing them with teleological hindsight as the precursors of an inevitable revolution.) This is not just an agreeable excursion into the antiquarian byways of our subject: it is the basis of the technical vocabulary in use today. No wonder Near Eastern prehistory (like prehistory in general, where no one can agree on a common usage of

terms like eneolithic or chalcolithic, and where the onset of the Bronze Age can precede the use of tin-bronze by up to a millennium) sometimes seems arcane. The entire vocabulary is (either literally, or in its assumptions) nineteenth-century—what the Brits (or even North Americans) would call 'Victorian'.

Of course, we all know this; we explain it to our students, we apologize for its inconsistencies and the lack of anything better, but at least people know what it means. Or do they? Isn't it actually so suffused with essentialism, dualism, teleology, progressivism, uniformitarianism and unilinealism (never mind the inconsistency) that it is an active impediment to analytical thought? I realized that it was when I found myself trying to decide where the Neolithic really began (the Levant or Iran? The Jordan valley? Syria? Southeast Turkey?), and asking why domesticated cereals seemed so relatively unimportant in certain areas, which nevertheless were clearly both sedentary and complex at an early date, whereas in other areas the association between sedentism and cereal-dependence seemed to be so neat and compelling. I realized that I, too, had taken a term which made some sense at a level of general description on a global or continental scale, and used it beyond its reasonable degree of analytical resolution. Moreover, I had been guilty of making unjustified equations and assuming linear and monocausal links between phenomena whose interrelationships were far more complex and interesting: even to the extent of calorific reductionism (that complexity must result from cereal domestication) and paradigmatic over-extension ('one model fits all'). My confusion, though perhaps pardonable within the constraints of an outdated vocabulary, arose primarily from treating words as if they had some simple relationship with the real world, and as if a thing had to have a simple origin as a point in space and time. 'The Neolithic' is a slogan, not a Platonic primordium; it begins where we find it useful to begin it, not at some empirically discoverable 'point zero'. So where does this leave 'the origins of farming'?

1.3 Alternative pathways

Farming began with the cultivation of large-seeded grasses and legumes, taking annual plants and propagating them in niches to which they would not normally have access—either because of competition from perennials, or because of seasonal flooding which would destroy the seeds. (I shall argue that the latter was the original context of their cultivation.) Such plants were relatively abundant in the Fertile Crescent because of the strong seasonality of its Mediterranean climate, and their habitats existed not far from the fertile plains where they were first sustained artificially (Blumler 1996). This distinctive climate, and environmental diversity at a plate boundary, explains the unusual spatial context within which farming began. A similarly unusual context in time is provided by the events accompanying the termination of the last glaciation: increasing warmth and moisture in an interval before postglacial conditions had stabilized, and moreover punctuated by a brief stadial episode temporarily returning to colder and dryer conditions, the Younger Dryas. An unusual time in an unusual place, when the elements were shaken up and reconfigured, in the presence of behaviourally modern human populations: this is the background from which farming emerged (Sherratt 1997). It says nothing, however, about the precise circumstances of its emergence (other than that, as an 'accident waiting to happen', it could perhaps have come about in several ways other than the one it did).

Knowing that it did, indeed, happen serves to de-sensitize us to the possibility that it might not have happened, or that other alternative things were happening as well—some of which we might confuse with it, because they look very similar. Not all sedentary societies are based on farming: the ethnographic record (classically the northwest coast of North America), or the archaeological record of areas where cereal-farming was late in arriving (Jomon Japan, for instance), are evidence that foragers can be not only affluent but complex as well. Even within Europe, the late Mesolithic of the Baltic becomes more complex with each new discovery (skin

boats for deep-sea fishing, cemeteries, post-built structures, permanent occupation of key sites). None of these, however, is called neolithic, in the Childean sense. Yet sites without pottery, stone axes or any evidence of cereal cultivation are routinely called 'neolithic' in the archaeological literature, just because they are more or less contemporary with ones that do, and share certain sorts of hunting equipment with them, and because they are sedentary and have houses. (I am thinking of Nemrik and Qermez Dere in Iraq, Hallan Çemi and Göbekli Tepe in Turkey, and even Nevalı Çori and early Çayönü, and no doubt others in adjacent parts of Iran: see, in general, Cauvin 1997.) These sites are clearly extremely important, and relevant to what subsequently happens (and becomes part of the 'neolithic package' as it then spreads to the Anatolian plateau and other parts of the Fertile Crescent and beyond); but is it helpful to call them 'neolithic', with all its farming associations and teleological baggage, as if they were a necessary step on the road to farming, rather than a phenomenon of global interest in their own right? I should stress that there is no dispute here about facts, and that all these points have been made forcefully by the excavators of these sites themselves (e.g., Özdoğan 1995; Hauptmann 2002); what is at issue are the conceptual categories into which we slot these observations, in our wider scheme of perception—and that I, for one, have failed to appreciate the importance of these sites because of the tendency to accommodate them to a 'neolithic' paradigm formed out of an alliance between prehistoric Europe and the southern Levant, in which 'farming' is a necessary precondition for complexity, or at least of sedentism, houses and the formation of substantial sites (e.g., Sherratt 2004, figure 1, map a).

What, then, to do? We could call such cultural phenomena 'neolithic', in a tentative sense, and await an 'achieved neolithic' at a later stage (e.g., Bischoff 2002); or we could revive the European term 'mesolithic', giving it a widened significance as a response to the new ecological opportunities of the late- and post-glacial period and perceiving it as being itself a wave-like phenomenon, beginning in low latitudes and travelling to higher latitudes as deglaciation, the range-extension of temperate species of plants and animals, and 'ecological rebound' progressed. In this conception, the classic 'Mesolithic' of Scandinavia would be a relatively late example of a more general phenomenon, beginning earlier nearer to the equator, and encompassing early seed-collectors and coastal communities, often using pottery surprisingly early (by comparison with Europe), in eastern Africa and around the Indian Ocean—with the Younger Dryas as a brief interruption of a more continuous process. The choice is essentially a rhetorical one. Using 'neolithic' is to impart a sense of teleology, but using 'mesolithic' might just confuse the issue further, by importing yet more European ideological baggage (and an implied inevitability of succession). Let us therefore be content with using the term 'forager climax', as a localised aspect of what I once (1980a) called 'the [worldwide] Postglacial Revolution'—but we have probably had enough revolutions in prehistory for now. It is sufficient to recognise that farming was a minority response to the heightened ecological productivity of the early Holocene, and only slowly took on the escalating expansionary properties which we subsequently associate with it.

1.4 The forager climax in the northern Fertile Crescent

The onset of the early Holocene brought about a bonanza. All around the world, human populations—along with those of other plants and animals—surged as a result of higher temperatures, increased precipitation, and higher levels of CO_2. Especially in the unusual conditions of adjustment—as sea levels slowly rose in response to ice-melt, and as forests slowly spread, creating vegetational associations which no longer exist today—there existed niches some of which are no longer available, and all of which have in any case been degraded by millennia of farming and intensified hunting. (We must allow, also, for a stronger monsoon system than has existed since circa 4000 cal BC, which is especially important for East Africa and Arabia: Roberts and Wright 1993.) Especially around the coasts and on coastal plains—areas subse-

quently submerged by rising sea levels—there were opportunities for the emergence of relatively dense forager populations. Caves in coastal regions, along the length of the Mediterranean and around the Black Sea and the Caspian, preserve a partial record of their presence which can be extrapolated to indicate the extent of mesolithic occupation more generally, as can occurrences of rock art in highland regions. As the record from Franchthi cave in the Peloponnese indicates (Runnels 2001), these communities were active in circulating materials such as obsidian (in this case from Melos) through extended networks of contact and interaction. Such webs encompassed both the Levant, supplied with obsidian from Cappadocia, and the 'hilly flanks' region of the Fertile Crescent, supplied from the area around Bingöl, long before farming began in these regions (Cauvin et al. 1998; Chataigner et al. 1998; Cauvin 2002). There is no reason to suppose that any area was 'isolated' from such small-scale flows of products and information. If for no other reason, it makes sense to view the whole perimeter of the Fertile Crescent as an interacting network of forager communities, linked in a set of interlocking circuits each with its own practical and ideological peculiarities dimly reflected in typological labels for their characeristic lithic industries (Natufian/'PPN', Trialetian, Zarzian/Zawi Chemian). What made certain parts of it peculiar (by comparison with Europe, say, or areas further east) was the degree to which a mixture of foraging (including cereal-collecting) and hunting allowed for sedentary occupation near to rivers flowing through relatively open country, with ease of movement in many directions and abundant game. Those at the exits to major routes into the mountains, where traffic-flows of resources such as obsidian were concentrated, had nodal positions and an enhanced incentive to sedentism.

These circumstances serve to make more understandable (even if they cannot fully explain) the extraordinary cultural florescence which took place at the northern end of two important routes: the 'Levantine Corridor' from the Jordan valley to the middle Euphrates (Bar-Yosef and Belfer-Cohen 1992; Bar-Yosef and Meadow 1995), and another axis of contacts (where varieties of the Kurdish language have been spoken in recent times) through the area which Robert Braidwood called the 'Hilly Flanks region' along the northern margins of the Fertile Crescent (Braidwood and Howe 1960). At the apex of these routes, where they converge in southeast Turkey, a group of major sites has been discovered in recent years (Özdoğan and Başgelen 1999; Hauptmann 1999), especially in front of the passes through the Taurus mountains, leading to obsidian and other highland resources on the other side of the mountain chain. Çayönü, on the way to the headwaters of the Tigris, lay on a major route subsequently followed by an Assyrian highway and a Roman road, and Göbekli Tepe and Nevalı Çori, between the Balikh valley and the upper Euphrates, are also positioned on critical axes of contact, linking mountain hinterlands and extensive lowland chains of onward transfer. The character of these sites in the ninth millennium BC was entirely 'mesolithic', in the sense that there is little indication of the importance of cereal cultivation, and their art depicts in three dimensions (probably with a background in wood carving before stone carving) the kinds of subjects otherwise encountered in rock art, and with an emphasis on maleness, fierce or dangerous animals, raptorial or carrion-eating birds, scorpions and snakes which contrast strikingly with the female figures and ungulates of contemporary Levantine and subsequent neolithic subjects (though they anticipate themes which will reappear on Çatalhöyük wall-paintings, and perhaps for similar reasons). They form part of a practice of male bonding in cult-houses, themselves associated both with architectural elaboration (carved pillars, terrazzo floors) and cult-equipment (decorated stone bowls, bird-head pestles) suggestive of shamanic transformation using hallucinogenic drugs (henbane?), and further associated with the transformation of natural substances into new materials ('copper metallurgy', as we reductively describe it in our utilitarian vocabulary, or lime-plastering). All this is literally fantastic, but gave rise not only to rectangular[2] houses of increasing constructional

[2]Rectangularity seems to be associated with the construction of larger buildings, in environments where timber was an important constructional element (e.g. for roofing): it is easier to roof a large rectangular building than

sophistication, and also perhaps to experiments in animal-keeping which provide the background to the first domestication of ovicaprids. (On the relation between sedentism and domestication, see Uerpmann 1996.) None of this was necessarily the result of cereal cultivation, and nor are the sites located in positions chosen for farming, even though Çayönü at any rate seems to have remained occupied at a time when cultivation seems to have become more important in this region, after 8000 cal BC.

I have phrased this description rhetorically (though by no means exaggeratedly) because it contrasts so strongly with the conventional picture of the 'origins of farming'; and nor does it in itself provide an account of how cereal cultivation might have begun. Quite the reverse: it shows how wild cereals formed a local component within a spectrum of gathered and hunted resources in supporting the elaboration of an essentially forager existence. There is no reason to suppose that this elaboration reflected an increasing reliance on cereals, or depended on their cultivation, or would necessarily have led to their cultivation. The assumption that control over carbohydrates gave rise to cultural complexity seems quite false. Nevertheless this area seems to have exerted an influence (architecturally, for instance, and perhaps in terms of animal management) on surrounding areas, and indeed to have initiated a tradition of architectural and artifactual elaboration which continued as the core of subsequent developments in the Fertile Crescent. The mesolithic origins of Near Eastern civilization?

This formula would be true only if it contained within itself the motor for expansion; and arguably this is precisely what is lacking. In showing what may be achieved by foragers, it misses the inbuilt dynamic of the conventional, calorie-based account of farming development: the feedback-loop between reliance on cultivated cereals and demographic growth. Arguably, therefore, the 'northern climax' was only one component of the neolithic revolution (to use that term with the benefit of hindsight); it was its dialectical conjunction with developments taking place in other parts of the network—with which it was increasingly combined, from 8000 BC onwards—which gave rise to the classic combination of cereal cultivation, domestic livestock and village life that was to spread with such speed in subsequent millennia, and to provide the basis for subsequent developments within the Fertile Crescent. Where, then, should we look for the origins of cultivation, and the burdens that it brought with it: 'in the sweat of thy brow shalt thou eat bread' (Genesis 3:19)?

1.5 The origins of dependence: floodwater farming and the beginning of cultivation

A characteristic class of models of farming origins may be called 'climate-driven', because they invoke climatic downturn as the forcing mechanism for intensification of subsistence practices involving higher labour-inputs than foraging. Jack Harlan long ago demonstrated how easy it was to harvest stands of wild grain (Harlan 1967), echoing the San (Bushman) informant who asked why they should perform the backbreaking labour of planting when there were so many mongongo nuts in the world (Lee and DeVore 1968)—a sentiment which may well have been held by the climax foragers of the previous section, in the northern Fertile Crescent. Both of these observations have entered the literature of farming origins, and together they convey an important truth: that the costs of cereal cultivation were a major disincentive to its adoption, which only took place in exceptional circumstances. They are reinforced by Theya Molleson's observations (1994) on the osteological pathology of female skeletons from neolithic Abu Hureyra, with their deformations and traumas resulting from the incessant grinding of grain; clearly these costs fell disproportionately on the female part of the population (who probably did much

a circular one, at least with systems of simple carpentry. This, rather than any specific correlation with social morphology, may have been behind the emergence of a rectangular tradition in the north.

of the cultivation as well). Cereals in general probably ranked after nuts as foods of choice, since so much labour was involved in their preparation, especially the early hulled varieties (Wright 1994, 2000). In the light of this downside of cereals, the explanation for their early cultivation has often appealed to 'Romer's rule'—the generalization from within palaeontology that innovations often arise from conservatism, in the sense that they emerged in order to permit the continuation of previous ways of life in declining circumstances but then opened up radically new alternatives (fish hopping from pool to pool as sea-levels declined, thus evolving legs from fins which then permitted the colonization of terrestrial environments, in a caricature example). The archaeological equivalent is the scenario that cultivation was an extension of foraging by other means (to adapt Clausewitz's dictum on the relation of war to diplomacy), in circumstances where previously abundant supplies of wild grain—on which human populations had become locally dependent, to sustain existing population levels—were contracting. Hence the appeal to the Younger Dryas, as a climatic forcing-mechanism leading to the deliberate cultivation of what had previously been a 'free good'. One drawback of this model is that it fails to account for the apparent fact that cultivation (to judge from the occurrence of 'domesticated' morphologies) only became common in the early Holocene, when these constraints should have been relaxed. (The climatic contexts of the earliest cultigens are not, however, entirely clear, and early Holocene cultivation could reflect practices established at an earlier stage: but nevertheless the archaeobotanical record does not at the moment clearly demonstrate an association of the first cultivation with climatic stress, and does not account for the persistence of this practice when the stress was relaxed.) Other variants of the climatic forcing model appeal to demographic displacement, and localized crowding in propitious circumstances (e.g., within the Jordan Rift: Kuijt and Goring-Morris 2002) at a time when other habitats were relatively less attractive; and such models may well capture some of the 'push' factors in a complex conjunction of conditions, as well as helping to explain why there was no going back from a dependence on cultivated grain when once it had been established.

There is, however, an alternative strand to the argument which emphasizes the 'pull' factors, and moreover one which is congruent with an expansion of cultivation in the early Holocene. This is the point of view put forward by Claudio Vita-Finzi (as a result of his early geomorphological work in the Wadi Hasa in Jordan), and succinctly summed up in his phrase 'geological opportunism', which he used as the title to his contribution to *The Domestication and Exploitation of Plants and Animals* (Ucko and Dimbleby 1969; Vita-Finzi 1969b). It is fair to say that its insights were not subsequently incorporated into the programme of work conducted by Vita-Finzi and the Higgs school (Vita-Finzi and Higgs 1970), but they stand as a far-sighted observation which may offer a clue to the circumstances we are seeking. Vita-Finzi's suggestion, derived from the characteristic locations of early farming sites in the Jordan valley, was that the increased runoff of the early Holocene created a set of spatially limited but highly productive environments where wadis or springs began to accumulate small alluvial fans, especially along the edge of the Jordan valley and more generally in the endorheic (internal drainage) basins or *khabras* behind the coastal mountain-chain of the Levant (some supported by artesian water: Wirth 1971, pp.108–114, Wirth 1998, p.15), which in the conditions of lowered evaporation during the later Pleistocene had been occupied by lakes. (This is concisely summarized in a block diagram, Fig. 23 in Vita-Finzi 1969a.) The classic example of such a location is Jericho, but its circumstances are replicated 15 km further north at Netiv Hagdud (Bar-Yosef and Gopher 1997), and perhaps also at a comparable location in the intervening Wadi 'Auja.[3] The relevance of this observation was reinforced by Bar-Yosef's suggestion (1986) that the PPN wall and tower at Jericho had been intended as a flood defense, and his definition of the small alluvial fan to the west of the site at the exit of the Wadi el Mafjah. Having noted the importance of such locations, Vita-Finzi's further observation was that these conditions were eminently suitable to

[3]Satellite images of these and other locations are available on the ArchAtlas website, at `http://archatlas.org`.

the mode of cultivation described for the traditional societies of the American Southwest, called 'floodwater farming' (Bryan 1929): a small-scale system of crop-growing taking advantage of seasonally wet ground, in which sowing took place after a small annual inundation.

Applying this model to the Jordan valley, one could envisage that the seasonal changes in water level at spring- or stream-outlets at the head of small alluvial fans along the edges of the Rift would limit the growth of other forms of vegetation in these habitats, and competition from annuals could be discouraged by small-scale clearance. Cereals would not naturally grow in such places (and even if introduced would not create a self-sustaining population), but would need to be re-sown each season. This would, in fact, create precisely the circumstances in which morphologically domesticated forms would rapidly predominate, if harvested by reaping rather than beating. Such a mode of cultivation would have been relatively light on labour, making cereals, if not a 'free good', at least a 'cheap good'. This would have been especially attractive in locations which were themselves at some distance from extensive stands of wild cereals in the hills, but which offered advantages of permanent water, concentrations of game and other gathered resources, and positions on an axis of movement along the Rift, by which exotic materials were supplied. The Jordan Rift itself was once described (by an authority on indigenous cultivation systems in Africa) as a 'natural greenhouse' (Allan 1972), emphasizing its suitability for small-scale experiments in horticulture.

Floodwater farming, which is a small-scale, horticultural version of what are more generally known as 'water-harvesting' techniques (Critchley and Siegert 1991; Prinz and Malik 2000), has been largely outgrown by most farming societies, because of the inevitably restricted conditions in which it can be practiced. Other forms of water-harvesting came into use in the agricultural margins of the southern Levant in the first millennium BC (Evenari et al. 1971), but these represent labour-intensive and spatially extensive versions of the technique at a relatively late date. A more immediately relevant analogy is provided by simple techniques of *bund* cultivation in Iran, or *sailaba* cultivation along the Indus. (The PPNA site of Gilgal, just below Netiv Hagdud, on a ridge further down the Wadi Salibiya, overlooked a natural *bund* in the early Holocene: Bar-Yosef and Gopher 1997; Tchernov 1994.) These systems merge on a larger scale with the kinds of *décrue* farming practiced around seasonally enlarged lake basins, allowing a catch-crop to be grown as the lake margin recedes. The latter are however more typical of areas with a monsoonal rainfall pattern, where—as with the Nile—these periodicities are complementary to the natural growth cycles of originally winter-grown cereals.) I discussed all these systems in 1980 (Sherratt 1980b, with references), without quite seeing how they might all fit together, beyond the observation that floodwater farming provided a plausible 'common ancestor' for systems which later differentiated into 'dry farming' and 'irrigation farming'. (Such thoughts are relevant to the origins of cereal cultivation throughout the world, especially perhaps to rice, where comparable conditions might be sought in Szechuan (Sichuan) before rice cultivation spread in more developed form down the Yangtse, to appear at sites like Jiahu and Hemudu.)

Some idea of how floodwater farming might work on the spring-fed margins of the Jordan Rift may be obtained from modern records of seasonal changes in spring discharge in these locations (e.g., Hosh 1995, fig. 1)—which of course reflect current patterns of precipitation and flow which need not be valid for the period in question—but if taken at face value indicate the possibility of a spring (three-month) growing period in the spatially limited locations affected by such discharge. A problem with this suggestion as a model for early cereal (or legume) cultivation is that although spring grown cereals were known in antiquity in the Mediterranean, it is hard (except in the case of barley) to envisage the rapid emergence in the early Holocene of such accelerated growth patterns in species genetically adapted to a longer, rainfall-dependent growing season in quite different habitats (pers. comm. Gordon Hillman, many years ago; Blumler 2002, p.105); but the suggestion is worth reviving if only because it captures something of the small-scale and experimental circumstances in which plant cultivation is likely to have emerged, and the unusual

conditions of its genesis. This suggestion has a wider significance in that these conditions were replicated along the whole length of the 'Levantine Corridor' (which we might now term the 'oasis route'), in the chain of endorheic basins from the Hasa and El Jafr basins in the south, along the Rift itself (occupied in the Pleistocene by the Lisan lake) with the Dead Sea basin and the Kinneret and Huleh basins, and continuing behind the anti-Lebanon—i.e., to the east of the northern length of the Rift itself—by way of Damascus, Palmyra and El Kowm, to be within striking distance of the bend of the middle Euphrates, giving the Corridor a natural linkage to the upper Euphrates and the rainfed areas through which it flows (see maps in Kuijt and Goring-Morris 2002). As an axis of cultural contacts and communication, this existed already in late Natufian times, during the Younger Dryas, and was presumably the channel down which exotic resources such as obsidian were supplied to the Levant in the late Pleistocene and early Holocene, with Mediterranean (and, later, Red Sea) mollusc-shells exchanged in return (Bar-Yosef and Mayer 2000)—along with distinctive organic materials (drugs, feathers, bitumen) not yet identified archaeologically, from the ecologically contrasting conditions at either end of the chain. The Damascus basin occupies a pivotal position in these links, and has an extensive fan created by the Barada river (now watering the *Ghouta*, the area of orchards and gardens which sustains the modern capital city), with an extensive chain of lakes around the perimeter of the fan (now represented by the Ataibeh and adjacent small lakes, then more continuous). This lakeside location was the setting of Tell Aswad—whose situation would thus resemble, on a larger scale, that of Gilgal (in overlooking a vast natural *bund*) more than Netiv Hagdud or Jericho, in positions higher up their respective alluvial fans. (Anticipating later discussion, it is also relevant to compare these locations with that of Çatalhöyük: see the satellite images on the ArchAtlas website.) By comparison with the 'early neolithic' sites mentioned in the previous section, therefore, these oasis-like conditions, in a chain along a natural corridor of movement, provided a distinctive set of habitats in which the experimental sowing of seeds might have begun. Their distinctive locations provided a further set of incentives for cultivation, in being offset from the main stands of wild cereals, by contrast with the northern sites which were surrounded by a natural abundance of wild resources.

It is important to emphasize once again at this point the fact that all of these sites formed an interconnected network, as indicated both by the rare but diagnostic materials like obsidian which can be demonstrated to have flowed between them, and also by their membership of a common typological community in things such as hunting equipment, as reflected in their common acceptance of a sequence of arrowhead types (which are the basis for the periodization of the PPN as a whole). This does not mean, however, that they shared a common subsistence basis, or that they jointly experienced a step-like series of stages of increasing dependence on cultivation; but it does allow for the transmission of cultivated strains of crops, and the practices of their cultivation, between adjacent groups—and perhaps for a growing body of cultivators along this axis, who may initially have used different cereals (barley, emmer, einkorn) in different places and circumstances. The limited genetic variability of domesticated cereal strains, by comparison with the diversity evident in wild populations of the same species (Zohary 1996) argues for a finite number of 'domestication events' for each of the founder species, which might nevertheless have emerged in parallel in similar circumstances as 'vicariant cultigens' (Sherratt 2004, p.57). Moreover the existence of the wider community of PPN groups in the Levant and those north of the Euphrates bend suggests the possibility of a closer coupling between the postglacial 'forager florescence' in the north and the postglacial 'geological opportunism' in the south, in terms of the incentive which it gave to occupy nodal positions in a supply chain linking both ends of the Corridor, reinforcing the linear tendency in settlement distribution, and perhaps allowing us to envisage not only exchange of goods but internal migration between them and

emulation of cultural achievements and practices initially restricted to particular parts of it.[4]

In some respects this reconstruction approaches Binford's (1968) model of the origins of farming, with growing populations of affluent foragers ('open systems, donor type') shedding surplus population into more marginal habitats ('open systems, recipient type') to increase pressure on resources and lead to intensification at the margin! Indeed, a fully syncretic formulation might even build in Kent Flannery's (1973) concept of initial cultivation as a 'deviation-amplifying mechanism' in the southern Levant, leading to increasing dependence on what had initially been a small-scale innovation in very particular circumstances. Almost all of the suggested models for the beginning of farming, for the last thirty years (Benz 2000), have some element of truth; the challenge is to mobilize them in their appropriate contexts, within the specific geographical circumstances of the different parts of the process, rather than treating them as competing universal explanations in a zero-sum game.

Although this discussion has focussed on the 'Levantine Corridor', it is important to bear in mind that this to some extent reflects the distribution of research opportunities in the last few decades; and it is worth noting that Çayönü, for instance, stands in the same relationship to Braidwood's 'Hilly Flanks' corridor (linking Çayönü with his earlier area of work at Jarmo in Iraqi Kurdestan) as for instance does Nevalı Çori in relation to the Balikh and the 'Levantine Corridor'—so that there may have been two axes of intensification, one down each side of the Fertile Crescent. The absence of a comparably detailed record of these periods in northeast Iraq and western Iran (and my relative unfamiliarity with their literature) gives an inevitably one-sided bias to this account, and it may well be that a more symmetrical reconstruction might be offered. On the other hand, it is equally possible—and rather more probable—that the areas along and adjacent to the Jordan Rift (the 'oasis route') did indeed provide a unique conjunction of circumstances leading to the appearance of cultivation, and that the appearance of similar phenomena along the eastern side of the Fertile Crescent represents a secondary spread.

Certainly, the appearance of substantial sites in classic farming locations in the Jordan valley such as Jericho and Netiv Hagdud (and perhaps as far up as Mureybet and Jerf el Ahmar, though their riverine locations may imply a different variety of cultivation techniques) at the very beginning of postglacial conditions, with polished axes and terracotta female figurines (those icons of the Neolithic, reflecting their characteristic tools and ideology respectively: Cauvin 1997), together with what are widely accepted as 'domesticated' plants (i.e., the outcome of artificial cultivation in the particular circumstances suggested above), do suggest that Levantine sites were practicing 'farming' when their northern neighbours were enjoying greater opportunities for 'foraging', and developing many of the characteristics which have traditionally been attributed to farming communities alone. These different responses arose from their contrasting environmental settings, within what was already a linked network of communities and which continued to be in increasing contact, as flows of products such as obsidian increased in volume to supply rising densities of population. These developments might thus be seen as a dialectical interaction, within an already established family relationship, and whose participation in a common network of exchanges was a fundamental aspect of their different forms of intensification. If we play the game of looking for a 'prime mover' of these events (a curious hangover from sixteenth-century theology), the accolade must be accorded equally to 'ecology' and 'trade'—or, put more generally, the opportunities afforded jointly by postglacial environmental changes and the geometry of webs of human communication, both set within a landscape of stark contrasts between mountains and plains, and between forests and desert, which restricted and channelled the mobilization of resources by human populations.

[4] It would be possible to tell this story in a slightly different way, emphasizing the centrality of the Euphrates bend as an intermediary in this chain of contacts and a focus of innovation: this would give greater prominence to the site of Jerf el Ahmar, for instance, which shares some of the characteristics of both ends of the axis, and links the Levantine corridor to the Cappadocian obsidian sources (Abbès et al. 2003).

1.6 Interaction and exchange: the synthesis and expansion of the 'neolithic package'.

At some point in the process, between 8500 and 8000 cal BC, the two areas began to interact more intimately (Harris 2002); and—especially as domestic livestock came to be integrated into the emerging package—some parts of the area began to show the kind of demographic expansion, even migrations, which were to become typical of later phases of enlargement, when the neolithic package was dispersed westwards across Europe and eastwards to the edge of the Indus valley. A key observation here is the recently discovered PPNB colonization of southern Cyprus (Peltenburg et al. 2000), at a date perhaps as early as 8700 cal BC.[5] Although it is tempting simply to draw an arrow from the nearest coastland (e.g., Sherratt 2004, fig. 1, map c), the lack of contemporary farming settlement on the northern Levantine coasts and Cilicia, by contrast with the plentiful appearance there of sites in the later Neolithic (see below), suggests that these well-watered and wooded areas—which stand out today as distinctive green strips on a satellite photograph—were only occupied by farmers at a later date, and may well have had their own hunting and foraging communities of the kinds documented for south-coastal Anatolia (at Beldibi, Belbai, Öküzini and Karain). The nearest area of the Levantine coast with contemporary evidence of PPN occupation is the Carmel region, where the Jezreel valley meets the sea, and the pattern of winds and currents suggests this as a plausible point of departure (interestingly paralleled in the late Bronze Age by the voyage of the Egyptian Wen-Amun, who was shipwrecked on the coast of Cyprus after travelling up the south Levantine coast—a suggestion I owe to Susan Sherratt). The apparently deliberate PPN colonization could thus represent a small northward movement of south-Levantine groups (albeit taking with them some features whose ancestry lies in the north), of the kind which might otherwise, but less visibly, have occurred along the Levantine corridor. In this case the Binfordian shedding of surplus forager population from north to south would have been reversed, by the early expansion of cultivators from the south. Whatever the case, it is symptomatic of expansionary tendencies in early or early middle PPNB, at the time when cultivation is plausibly suggested on sites hitherto characterized as parts of the foraging climax; and indeed it broadly coincides with a tendency to locational shift in these communities, from earlier-occupied sites to newly-founded ones at places like Cafer Höyük, Gritille or Mezraa-Teleilat—precisely the point at which it becomes appropriate to speak of an 'achieved neolithic' in these areas (Bischoff 2004). Nor was this movement one-sided, for it was apparently as part of this closer relationship between the Levantine corridor and the north that elements such as rectangular architecture and domestic livestock became increasingly evident in the south, along with an elaboration of ritual practices (like the statues of Ain Ghazal: Rollefson 1983; Salje et al. 2005). It is thus from this stage that the 'neolithic package' in its early form can be considered to have been assembled, and at which a line enclosing a distribution of 'early farmers', from the Jordan rift to southeast Anatolia, may convincingly be drawn. 'The Neolithic', in the sense that Childe conceived it, was a synthesis of this dual inheritance; and the expansion of farming settlement beyond this area was symptomatic of its potential for growth.

A second new area to be opened up to farming at around this time, in the early and middle PPNB, was the Anatolian plateau, where the occupation of Aşıklıhöyük began in the centuries just before 8000 cal BC (Esin and Harmankaya 1999). The appearance of farming settlements in this region must surely have been related to developments taking place on the other side of the mountains, reflecting both the growing demand for obsidian and perhaps also the settlement of new areas suitable for simple forms of cultivation. Unlike the Cyprus example, however, there

[5]The location of PPN Parekklisha-Shillourokambos (Guilaine and Le Brun 2003), where runoff from the southern slopes of the Troodos is concentrated behind the hills running parallel to the southern coast, offers an environment with abundant surface water.

were also indigenous population of foragers to be considered. Cappadocian obsidian sources had supplied communities on the Euphrates bend and in the Levantine corridor on a small scale in earlier periods, when they had presumably been worked (as in the terminal Pleistocene) by indigenous foraging groups in contact with related communities across the Taurus. The techniques used in the extraction-site of Kömürcü-Kaletepe P-32, however, which dates to 8300–8200 cal BC, indicate a new type of large-scale production of large, prestige types for export, of the kind which circulated within the Levantine corridor (and, indeed, Cyprus), and contrasting with contemporary microlithic industries in the caves of southern Turkey and at some sites further inland (Binder 2002). This suggests that small enclaves of farming population, directly linked to the middle Euphrates and the Levant (and perhaps attempting to bypass existing indirect modes of exchange), may have been established in the intervening area. Such groups would have avoided the forested coastal mountains surrounding the Bay of Iskenderun, and selected environments suitable for simple horticulture in moist conditions: likely places for such sites would be the intermontane basin of Elbistan, with its abundant surface water, or the eastern end of the south-central Anatolian basin south of Erciyes Dağ. The occupation of such areas would thus represent a small colonizing movement like the move to Cyprus, leading to the further proliferation of farming settlements on the Anatolian plateau—which here involved varying degrees of interaction with (and incorporation of) indigenous foraging groups.[6]

The locations occupied by early farmers in the south-central parts of the Anatolian plateau (Cappadocia and the Konya plain) bear a striking resemblance to those discussed above at an earlier phase in the Levantine corridor, typically situated on small fans at the edges of the plain or around small internal-drainage basins (some occupied by saline lakes), within relatively open environments (see especially the maps of Kuzucuoğlu 2002, cf. Cohen and Erol 1969; Cohen 1970; French 1970; Roberts et al. 1999). It is thus arguable that techniques of cultivation were transferred to the plateau environment from the Fertile Crescent without significant alteration, still at the scale of floodwater farming (though now with free-threshing wheats and complemented by some domestic livestock). A successive occupation of such locations can be postulated, from east to west in Cappadocia and the Konya plain: beginning perhaps in the Sultansazliği basin south of Erciyes Dağ (where sites such as Hacıbeyli occupy small fans from rivers entering this small endorheic basin, some 25 km in diameter), the next phase would have reached the Melendes Çay (including Aşıklıhöyük) and then extended to the small fans on the inner margins of the Taurus, hypothetically at Ereğli and demonstrably at Can Hasan III near Karaman, dating to around 7500 cal BC, and finally a century or so later to occupy the largest alluvial fan of all, that of the Çarşamba Çay in the Konya basin, on which stands Çatalhöyük (see maps in Kuzucuoğlu and Gérard 2002). The last of these represents such a major concentration of water resources in this otherwise arid basin, attractive to game as much as to human populations, as to make it likely that occupation of this major resource would have involved the absorption of a substantial number of its existing hunting and foraging occupants, to a far greater extent than at the other locations: and this, together with the concentration of farming population in a single site (perhaps as a consequence), may help to explain the unique character of the organization and art of Çatalhöyük. I see no reason, however, to doubt that it represents an unusually large-scale application of the techniques of floodwater farming which explain the pattern of locational choices back to Jericho and Netiv Hagdud (though technical discussion of the lines of evidence which lead the excavators of Çatalhöyük to question this must await publication of the evidence, now in press). In geographical terms, it represents the continuation of a pattern typical from the beginning of cultivation, in which early farming sites are closely tied to particular pockets of

[6]To some extent this may be reflected in the degree to which microlithic industries continued to be used (Binder 2002)–notably at Aşıklıhöyük (though not at Can Hasan III, in a different environmental setting). On the other hand, the agglomerated patterns of architecture at all of these sites (which together with the lack of cult-houses differentiates them from southeast Anatolian and Levantine PPNB sites) may have more to do with the more rigorous winter climate of the Anatolian plateau than with the cultural origins of their inhabitants.

well-watered terrain. This was to be the pattern for much of the early extension of cultivation systems in the following millennium, through the lowland basins of western Anatolia, Thessaly and the Balkans (Sherratt 1972, cf. van Andel et al. 1995): small enclaves of horticulturalists were established in conditions which replicated the situations where cultivation first emerged.

1.7 Subsequent spread: the dialectic of expansion

Just as the genesis of farming involved a dual origin and a dialectic between farmers and foragers, so did its subsequent spread. The story of the advance of farming across Eurasia was a two-sided affair, involving the absorption and conversion of indigenous populations as much as the demographic proliferation of farmers. Small migrations certainly occurred (and perhaps larger ones where conditions allowed), but by and large the two mechanisms of dispersal were fairly evenly matched, and certainly closely interwoven. This is the picture which is emerging from local studies in areas of abundant evidence in Europe (Bánffy 2000; Gronenborn 1998); and it is possible to suggest that a similar picture may hold true at an earlier date for Western Asia.

After 8000 cal BC, with the PPNB incursions into surrounding areas (including potentially the eastern arm of the Fertile Crescent, not followed here), the interconnected parts of the enlarged network experienced a climax in LPPNB, in the later part of the eighth millennium. This was marked by the emergence of sometimes spectacularly large sites at nodal positions throughout the network of closely interconnected communities (Çatalhöyük, Abu Hureyra, Ain Ghazal, Basta—the last two reflecting a major route down the eastern side of the Jordan valley to the Gulf of Aqaba (source of the Red Sea shells), which took over from the oases on the western side of the Rift as the main artery of communication in this area, along the line later followed by the 'King's Highway' in Biblical times. The wider linkage of this area with the eastern axis is indicated by the more general appearance in the Levant of obsidian from sources in eastern Anatolia, and the establishment of a substantial settlement at Bouqras, on the Euphrates opposite the mouth of the Khabur (Akkermans et al. 1983), which could have acted as an entrepot in exchanges across the eastern and western axes of the Crescent (in the manner of second-millennium Mari or Hellenistic Dura Europos). Such nodal centres would have arisen at critical articulation points in an arterial network.

A larger extension of the neolithic community took place during the period variously referred to as 'Final PPNB', 'PPNC', or 'early Pottery Neolithic' (since pottery was making its appearance in some parts of the area, though not others). This enlarged area, incorporating the coasts and forested mountains of the northern Levant and southeastern Anatolia mentioned earlier as initially avoided by farmers, looks like a classic case of the conversion of a pre-existing area of 'mesolithic' persistence in environments which provided ample alternatives to cereal cultivation (the mongongo nut scenario), but were ultimately absorbed in a growing network of farmers. The process is most strikingly exemplified in Cilicia (Caneva 1999), where the founding of Mersin around 7000 BC was echoed in the appearance of a multitude of later neolithic (pottery-using) sites around the margins of the bay of Iskenderun.[7] Coastal sites had begun to appear in the previous phase in the northern Levant (e.g., Ras Shamra), but now occurred at locations off the modern Carmel coast where they were subsequently covered by rising sea levels. The addition of new areas to the farming network altered the potential pattern of contacts, reducing the advantages of formerly axial routes and nodal positions. The new coastal dimension provided an alternative distribution chain for Cappadocian obsidian, for instance, which removed the monopolistic advantage of supersites along the Levantine corridor and resulted in their relative decline and a dispersal of their population (for a description of these settlement-

[7] If the radiocarbon dating of the earliest neolithic at Knossos is accurate, this is also the point at which farming arrived in Crete: can one envisage small coastal migratory movements like that which took farmers to Cyprus a millennium earlier?

pattern changes see Kuijt and Goring-Morris 2002).[8] This devolution preceded the apparently catastrophic change affecting a large area of the Levant and adjacent regions around 6200 BC which brought the whole PPN complex to an end (and which also saw the shift of location from Çatalhöyük East to Çatalhöyük West, part of a more general pattern of relocation marking the beginning of the Anatolian early Chalcolithic), which can plausibly be attributed to a brief but large-scale climatic anomaly perhaps caused (like the Younger Dryas itself) by a final pulse of glacial meltwater released into the Atlantic circulation from the remains of the Laurentide ice sheet (Klitgaard-Kristensen et al. 1998; Renssen et al. 2002).[9]

The 'Pottery Neolithic' also saw a major extension of the area within which farming occurred in western Anatolia, most clearly seen in the extension of sites in the Pisidian Lake District and other areas bordering the Konya plain (e.g., Ilıpınar) after 6500 cal BC (Kuzucuoğlu and Gérard 2002), and perhaps symptomatic of a further extension into key areas such as the plain of Eskihehir where traces are so far more enigmatic, but would provide a logical step towards Northwest Anatolia where neolithic sites are known in some numbers towards the end of the millennium. This, like the incorporation of coastal areas in the Levant, marks a scale of extension beyond simple migration of the kind seen earlier, and arguably implies the absorption of indigenous populations over a wide area—although involving the spread of a material culture closely related to that of established farming regions. Such 'block conversions' of large areas, later repeated on an even larger scale with Criş/Körös in the Danube basin, indicate how the neolithic package had taken on a new dynamic of expansion, typical of the way in which it was to spread over large areas of Europe. The collapse of 'PPN' cultures in the Levant, and the continuing spread of their spinoff-cultures into the Balkans and beyond, marked the end of the first chapter in the construction of the Neolithic.

1.8 Beyond cereals

This paper has tried to highlight two themes: the first is the parallelism in the development of forager and farmer societies, and the continuing dialectic between them; the second is the existence of large structures such as trade networks (most obvious in the case of obsidian) which lie behind both of them. The growing dependence on cereals, and the inherent dynamic which it imparted, has been less central to its concerns. This is in part because it is already an accepted element in our understanding of the Neolithic, and has been since Gordon Childe placed it as the defining characteristic of the whole concept. Yet it is salutary to look beyond it, and to see what cereals on their own fail to explain. The de-coupling of cereal domestication and social complexity (like the recognition that urban civilization emerged in the New World essentially without metallurgy or animal traction) imparts a new flexibility to concepts generated in a particular context and allows us to look for more fundamental correlations. In the case of monumental construction and the elaboration of fixed material culture, it helps us to understand why the most spectacular monuments of neolithic culture, in the form of megalithic tombs and ceremonial monuments, lay in the west and north of Europe, not in the Balkans—in areas where the 'mesolithic inheritance' was strongest, not in the areas where cereal production was most effective. It is the diversity of lifeways which came together, not the size of their calorific base, which explains their complexity. In the same spirit, we might reexamine some of the phenomena hitherto attributed to irrigation and improved cereal production in Western Asia, such as the

[8]This scenario bears a striking resemblance to that proposed for the end of the late Bronze Age by Susan Sherratt (2000), in which the traffic in exotic and scrap metal by coastal traders undercut the monopoly bulk trade in such items which was the basis for the power of palatial centres in the Aegean and Levant.

[9]Such a brief (perhaps two to three centuries) but dramatic climatic excursion may, paradoxically, have been instrumental in accelerating the spread of farming in the north Aegean and the Balkans, by destabilizing the established forager systems and allowing farmers to expand into the vacated areas... but that is another paper.

emergence of civilization in southern Mesopotamia. This, too, was an area were foragers of various kinds are likely to have persisted, and provided a diversity of lifeways in this shifting marsh. Was this diversity a factor in the rise of ceremonial centres and monumental temples, integrating fishermen and fowlers as well as farmers and herders? Such thoughts hint at factors which are as yet unexplored in conventional explanations of the rise of complexity as it was elaborated beyond the village community, and suggest deeper roots than have hitherto been sought.

In the same way, this paper has attempted to apply models of the structural relationships between sites and regions which have normally been used only in the context of more advanced economies, but can here be seen to illuminate not only neolithic supersites such as Ain Ghazal but also their forager precursors such as early Çayönü or Göbekli Tepe (cf. Jacobs 1965). Such sites only make sense within networks that extend not only between sites but between regions, at nodal points where flows of products converge and where local conditions provide the resources to sustain larger communities. These principles are independent of the specific nature both of the moving products and the sustaining resources: the analysis can apply equally to ninth millennium Çayönü or fourth millennium Susa. It is only the scale which makes the difference, not the geometry.

None of this is to downplay the crucial role of cereal cultivation in the history of humankind. Its contribution was twofold: in providing a 'calorific subsidy' comparable to that of fossil fuel in the Industrial Revolution, and in imparting a degree of instability to human populations, both through the effects of a carbohydrate diet on human demography, and through the capacity of cereal crops to respond to increasing labour inputs and to sustain unparalleled degrees of population growth. The neolithic chapter of their history was only the prelude to their expanding role throughout the Holocene, which saw the world population of the Cerealia, like that of *Homo sapiens* itself, undergo an exponential rate of proliferation. The beginnings of farming initiated an ever-accelerating pace of change, of which we (and today's genetically modified cereals) are the involuntary inheritors.

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