AFTER THE ICE

A Global Human History, 20,000–5000 BC

Steven Mithen

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The Birth of History

Global warming, archaeological evidence and human history

Human history began in 50,000 BC. Or thereabouts. Perhaps 100,000 BC, but certainly not before. Human evolution has a far longer pedigree – at least three billion years have passed since the origin of life, and six million since our lineage split from that of the chimpanzee. History, the cumulative development of events and knowledge, is a recent and remarkably brief affair. Little of significance happened until 20,000 BC – people simply continued living as hunter-gatherers, just as their ancestors had been doing for millions of years. They lived in small communities and never remained within one settlement for very long. A few cave walls were painted and some rather fine hunting weapons were made; but there were no events that influenced the course of future history, that which created the modern world.

Then came an astonishing 15,000 years that saw the origin of farming, towns and civilisation. By 5000 BC the foundations of the modern world had been laid and nothing that came after – classical Greece, the Industrial Revolution, the atomic age, the Internet – has ever matched the significance of those events. If 50,000 BC marked the birth of history, 20,000–5000 BC was its coming of age.

For history to begin, people required the modern mind – one quite different to that of any human ancestor or other species alive today. It is a mind with seemingly unlimited powers of imagination, curiosity and invention. The story of its origin is one that I have already told – or at least tried to tell – in my 1996 book, The Prehistory of the Mind. Whether the theory I proposed – of how multiple specialised intelligences merged to create a ‘cognitively fluid’ mind – is entirely right, wrong or somewhere in between is not an issue for the history that I will now recount. All the reader must accept is that by 50,000 years ago, a peculiarly creative mind had evolved. This book addresses a simple question: what happened next?

The peak of the last ice age occurred at around 20,000 BC and is known as the last glacial maximum, or LGM. Before this date, people were thin on the ground and struggling with a deteriorating climate. Subtle changes in the planet’s orbit around the sun had caused massive ice sheets to expand across much of North America, northern Europe and Asia. The planet was inundated by drought; sea level had fallen to expose vast and often barren coastal plains. Human communities survived the harshest
conditions by retreating to refugia where firewood and foodstuffs could still be found.

Soon after 20,000 BC global warming began. Initially this was rather slow and uneven – many small ups and downs of temperature and rainfall. By 15,000 BC the great ice sheets had begun to melt; by 12,000 BC the climate had started to fluctuate, with dramatic surges of warmth and rain followed by sudden returns to cold and drought. Soon after 10,000 BC there was an astonishing spurt of global warming that brought the ice age to its close and ushered in the Holocene world, that in which we live today. It was during these 10,000 years of global warming and its immediate aftermath that the course of human history changed.

By 5000 BC many people throughout the world lived by farming. New types of animals and plants – domesticated species – had appeared; the farmers inhabited permanent villages and towns, and supported specialist craftsmen, priests and chiefs. Indeed, they were little different to us today: the Rubicon of history had been crossed – from a lifestyle of hunting and gathering to that of farming. Those who remained as hunter-gatherers were also now living in a manner quite different to that of their ancestors at the LGM. The remit of this history is to explore how and why such developments occurred – whether they led to farming or new types of hunting and gathering. It is a global history, the story of all people living upon planet earth between 20,000 and 5000 BC.

This was not the first time that the planet had undergone global warming. Our ancestors and relatives – the *Homo erectus*, *H. heidelbergensis* and *H. neanderthalensis* of human evolution – had lived through equivalent periods of climate change as the planet see-sawed from ice age and back every 100,000 years.6 They had responded by doing much the same as they had always done: their populations expanded and contracted, they adapted to changed environments and adjusted the tools they made. Rather than creating history, they simply engaged in an endless round of adaptation and readaptation to their changing world.

Neither was it the last. In the early twentieth century AD, global warming began anew and continues apace today. Once again new types of plants and animals are being created, this time through intentional genetic engineering. Like these novel organisms, our modern-day global warming is a product of human activity alone – the burning of fossil fuels and mass deforestation.7 These have increased the extent of greenhouse gases in the atmosphere and may raise global temperatures far beyond that which nature alone can do.8 The future impacts of renewed global warming and genetically modified organisms on our environment and society are quite unknown. One day a history of our future times will be written to replace the multitude of speculations and forecasts with which we struggle today. But before that we must have a history of the past.
The people who lived between 20,000 and 5000 BC have left no letters or diaries that describe their lives and the events they both made and witnessed. The towns, trade and craftsmen had to be in place before the invention of writing could occur. So rather than drawing on written records, this history examines the rubbish that people left behind – people whose names and identities will never be known. It relies on their stone tools, pottery vessels, fireplaces, food debris, deserted dwellings and many other objects of archaeological study, such as monuments, burials and rock art. It draws on evidence about past environmental change, such as pollen grains and beetle wings trapped in ancient sediments. Occasionally it gains some help from the modern world because the genes we carry and the languages we speak can tell us about the past.

The risk in having to rely upon such evidence is that the resulting history may become little more than a catalogue of artefacts, a compendium of archaeological sites or a succession of spurious 'cultures'. A more accessible and appealing history is one that provides a narrative about people's lives; one that addresses the experience of living in the past and recognises human action as a cause of social and economic change. To achieve such a history, this book sends someone from the modern day into prehistoric times: someone to see the stone tools being made, fires burning in the hearths and the dwellings occupied; someone to visit the landscapes of the ice-age world and to watch them change.

I have chosen a young man by the name of John Lubbock for this task. He will visit each of the continents in turn, starting in western Asia and working his way round the world: Europe, the Americas, Australia, East Asia, South Asia and Africa. He will travel in the same manner as an archaeologist digs – seeing the most intimate details of people's lives but being unable to ask any questions and with his presence quite unknown. I will provide a commentary to explain how the archaeological sites were discovered, excavated and studied; the ways in which they contribute to our understanding of how farming, towns and civilisation arose.

Who is John Lubbock? He resides in my imagination as a young man with an interest in the past and fear for the future – not his own but that of planet earth. He shares his name with a Victorian polymath who, in 1865, published his own book about the past and called it Prehistoric Times.

Victorian John Lubbock (1834–1913) was a neighbour, friend and follower of Charles Darwin. He was a banker who instigated key financial reforms, a Liberal Member of Parliament who produced the first legislation for the protection of ancient monuments and bank (public) holidays, a botanist and entomologist with many scientific publications to his name. Prehistoric Times became a standard textbook and best-seller, with the seventh and final edition appearing in 1913. It was a pioneering work, one of the first to reject the biblical chronology that claimed the world to be a
mere six thousand years old; it introduced the terms Palaeolithic and Neolithic, the Old and New Stone Ages, which are now recognised as the key periods of the prehistoric past.

But Victorian John Lubbock's insights were matched by an appalling ignorance. He knew little about the date and duration of the Stone Age; his evidence for ancient lifestyles and environments was scant; he had never heard of Lascaux, prehistoric Jericho and innumerable other sites that are known today as milestones of the human past. When planning this book I considered sending Victorian John Lubbock to such sites in gratitude for writing *Prehistoric Times*. But his time has gone; even with experience of Lascaux and Jericho I thought it unlikely that he would have abandoned the standard Victorian attitude that all hunter-gatherers were savages with child-like minds.

A more appropriate beneficiary of prehistoric travel is one who is yet to make his mark upon the world. And so I will send a modern-day John Lubbock into prehistoric times, carrying a copy of his namesake's book. By reading it in remote corners of the world he will appreciate both the achievements of Victorian John Lubbock and the remarkable progress that archaeologists have made since *Prehistoric Times* first appeared less than 150 years ago.

I make use of John Lubbock to ensure that this history is about people's lives rather than just the objects that archaeologists find. My own eyes cannot escape the present. I am unable to see beyond the discarded stone tools and food debris, the ruins of empty houses and the fireplaces that are cold to the touch. Although excavations provide doors to other cultures, such doors can only be forced ajar and never passed through. I can, however, use my imagination to squeeze John Lubbock through the gaps so that he can see what is denied to my own eyes, and become what the travel writer Paul Theroux has described as a 'stranger in a strange land'.

Theroux was writing about his own desire to experience 'otherness to its limit'; how becoming a stranger allowed him to discover who he was and what he stood for.¹² This is what archaeology can do for all of us today. As globalisation leads to a bland cultural homogeneity throughout the world, imaginative travel to prehistoric times is perhaps the only way we can now acquire that extreme sense of otherness by which we recognise ourselves. And it is the only means that I have found to translate the archaeological evidence I know into the type of human history I wish to write.

When I peer at the deserted dwellings uncovered by my own excavations I often share the thoughts of another great travel writer, Wilfred Thesiger. In 1951 he had lived with the Marsh Arabs of southern Iraq. When returning the following year he arrived at dawn and looked across the vast reed beds silhouetted against the sunrise. Thesiger recalled his first visit – the canoes on the waterways, the crying of geese, reed houses built upon water, the
dripping buffalo, boys singing in the dark, the croaking of frogs. 'Once again I experienced', he later wrote, 'the longing to share this life, and to be more than a mere spectator.'

The techniques of archaeology have enabled us all to become spectators of prehistoric life – albeit through a fuzzy lens. Like Thesiger, I long to go further: to experience prehistoric life itself and use such experience to write human history. Thesiger could depart in his canoe; all I have is my imagination, informed by a meticulous and exhaustive study of archaeological evidence. And so, within the pages of this book, John Lubbock fulfils my wish to become more than a mere spectator. Through him, I become like Theroux and Thesiger, a stranger travelling through strange lands – in my case, those of prehistoric times.
Through gaps in the leafy trees John Lubbock sees five or six dwellings aligned along the woodland slope. They are cut into the earth itself, having subterranean floors and low drystone walls that support roofs of brushwood and hide. With such well-built and neatly ordered dwellings the village looks quite different to what now seem haphazardly planned and hastily built settlements at Ohalo and Azraq. People have evidently planned to live within this village all year round. It is ‘Ain Mallaha, a village of the new lifestyle that has emerged within the oak woodlands that grow across the Mediterranean hills. More than a new lifestyle – a completely new culture, that which archaeologists call the Natufian. Ofer Bar-Yosef, Professor of Archaeology at Harvard and doyen of west Asian archaeology, believes this culture to be the ‘point of no turning back’ on the road to farming.

As he stands on the threshold of the village, Lubbock watches its people at work. They are tall and healthy, dressed smartly in clothes made from hide, some wearing pendants of shell and bone beads. Just as at Ohalo, their main work is turning wild plants into food, plants that have been gathered in the woodland and on the forest steppe. But their undertaking is now quite different, far larger in scale and far harder work. The stone mortars they use are of boulder proportions. There are many hands at work – grinding, pounding, shelling and cutting. Baskets of acorns and almonds are waiting to be opened and then ground into flour and paste.

Lubbock strolls between the workers, peering over their shoulders, stealing a little almond pulp to taste. Rich crushed-vegetable and wood-smoke aromas meld with the rhythmic pounding of mortars, the gentle chatter of adults and laughter of children. But not all the adults are at work; some sit idly in the afternoon sun, at least two women are heavily pregnant. Another leans against the wall of a dwelling with a dog asleep in her lap. Lubbock passes by, stepping between pits lined with plaster in which nuts are stored for future use, and enters her dwelling. Its remnants will eventually be excavated by the French archaeologist Jean Perrot in 1954 and become known unglamorously as no. 131.

Dwelling 131 is a little larger than the others, perhaps 9 metres across, allowing five or six people to sit or sleep in comfort. Parts of the interior are
dark and musty; elsewhere broken beams of afternoon sun enter through the brushwood roof, a roof supported by internal posts wedged upright and stabilised by rocks. The stone walls are draped with hides and rush mats cover the floor.

Just inside the entrance there is a spread of ash where a fire had burned the previous night to keep the biting insects at bay. Another hearth now glows in the centre of the floor; a man squats alongside and plucks a brace of partridges. He cuts the birds into joints and places them to cook on hot stone slabs. Behind him a third fire is burning, providing a focus for a few young people who are repairing bows and arrows. Flat stones with deep parallel grooves are used to straighten thin branches to be used as the shafts; razor-sharp flakes of flint are attached using resin to form points and barbs.

Stone pestles and mortars, wicker baskets and wooden bowls, are stacked around the walls. Hanging from the rafter is a group of tools quite unlike any that Lubbock has seen before – sickles. Their bone handles are either decorated with geometric patterns or have been carved into the form of a young gazelle. The blades are made from five or six flint flakes, set tightly into a groove using resin. As they dangle, spin and catch the sunlight the blades glisten, having been polished by the many thousands of plant stems they have cut.

Jean Perrot found the remnants of this domestic scene when he excavated dwelling 131 at ‘Ain Mallaha – holes and clusters of stones where the roof supports had been, bird bones scattered around stone slabs within an ancient hearth, flint cores and flakes, grooved stones, basalt mortars, and flint blades. Many of the blades hold ‘sickle-gloss’, indicating that they had been used to cut a great number of plant stems, most likely of wild wheat and barley. Of course Perrot did not find the rush mats, the hides, wicker baskets and wooden bowls – we can only guess at the presence of these to provide some comfort, and to make the best use of the many materials available in the woodland.

A short distance from dwelling 131 Lubbock finds another that has been abandoned – its roof and walls have long since collapsed, its stone foundations robbed for use elsewhere. In the absence of the living, this deserted and dilapidated dwelling has become a cemetery. The graves are unmarked but contain richly decorated bodies. Jean Perrot found eleven men, women and children, all from separate graves and probably members of one family. Four of them had worn necklaces and bracelets made from the toe bones of gazelle and seashells, notably the long, thin and naturally hollow dentalium shells, as already seen at Azraq. One woman had worn an elaborate bonnet on her head, made from row upon row of such shells.

Within a few years, dwelling 131 will also be abandoned and will house the dead of another ‘Ain Mallaha family. Twelve individuals will be buried there, five of whom will be decorated in a similar fashion. One of the dead
will be an elderly woman; she will lie with a puppy, curled up as if asleep. Her hand will rest on its little body – much as it had done throughout the dog’s short life.\footnote{7}

There is a large stone mortar carved into a protruding piece of bedrock close to the centre of the village, on which Lubbock sits to appreciate the scene. When I sat upon that same stone in 1999, ‘Ain Mallaha had just undergone renewed excavations by another French archaeologist, François Valla. It was deserted and silent other than the song of a woodland bird. But Lubbock sees large nodules of basalt being turned into pestles and mortars, the surface of one being decorated with an intricate geometric design.\footnote{8} He listens to the chipping of stone, the chatter of voices and bark of dogs. He watches people making beads – cutting dentalium shells into segments and threading them on to twine. The wooden bowl from which the shells are taken also contains a bivalve that had originated in the waters of the Nile. Perhaps it had been traded from person to person, from settlement to settlement until it travelled at least 500 kilometres north; or perhaps it was the memento of a long journey made by one of the ‘Ain Mallaha villagers.\footnote{9}

As was the case at Ohalo and Azraq, people are chipping stone nodules. At ‘Ain Mallaha a new design of microlith is being made: thin rectangular blades of flint are carefully chipped into crescents – or lunates as archaeologists call them. Some are used in sickles, others as barbs on arrows. Why this particular design of microlith gained such popularity remains unclear – probably for no reason other than that people are such compulsive followers of fashion.

Lubbock leaves the village for the woodland as the light begins to fade. The pounding slows, the rhythm is lost, and then it stops, as does the chipping of stone. The ‘Ain Mallaha people return to their dwellings or congregate around fires. Gentle chatter turns to quiet song. Mice and rats come out to feed on the nuts and seeds that have been dropped; dogs come to chase them away.

With the last of the light, Lubbock reads some more of *Prehistoric Times*. Although disappointed to find nothing about western Asia, two passages seem pertinent to ‘Ain Mallaha. In one, his Victorian namesake has drawn together tiny scraps of evidence to suggest that dogs had been the first domesticated species.\footnote{10} But in another he seems to have been completely wrong:

the true savage is neither free nor noble; he is a slave to his own wants, his own passions; imperfectly protected from the weather, he suffers from cold by night and the heat of the sun by day; ignorant of agriculture, living by the chase, and improvident in success, hunger always stares him in the face, and often drives him to the dreadful alternative of cannibalism or death.\footnote{11}
Modern John Lubbock wishes that he could show his namesake the substantial houses, the clothing and food now being eaten within the village – all made by people quite ignorant of agriculture but seeming to be both noble and free. He drifts to sleep as the Natufian singing merges imperceptibly with the hooting of owls and scratching of beetles.

'Ain Mallaha was just one of several Natufian villages established at around 12,500 BC in the woodlands of the Mediterranean hills. Another was 20 kilometres to the southwest at Hayonim Cave. Ofer Bar-Yosef and his colleagues began excavating this cave in 1964, and continued for eleven seasons of fieldwork. Six circular structures were found within the cave, each about 2 metres in diameter, some with drystone walls still standing up to 70 centimetres high and paved floors. One had been used as a workshop rather than a dwelling, first as a limekiln and then for working bone. Close to the cave wall a cache of rib bones from wild cattle were found, some partially turned into sickles. Beads made from fox teeth and the leg bones of partridges were also recovered – material never used in this fashion by people at ‘Ain Mallaha. Conversely their favoured bones for jewellery, the toe bones of gazelle, were extremely rare at Hayonim.

This difference in jewellery suggests that the Natufian people from each village were concerned with asserting their own identity. Marriage between people from ‘Ain Mallaha and Hayonim seems to have been rare, as the two populations were biologically distinct. As evident from their skeletal remains, those from Hayonim were significantly shorter and a large proportion of them had ‘agenesis’ of the third molar – which means that it simply never grew – a condition that was very uncommon at ‘Ain Mallaha. This inherited condition would have been equally present at both villages had there been regular marriages between their peoples. Yet it seems unlikely that either village contained sufficient inhabitants to have been a viable reproductive community in itself. The people at Hayonim may have been linked with those at another Natufian village, known today as Kebara. These two villages share decorated bone objects with almost identical, and complex, geometric designs.

Each village had its own cemetery, often containing richly decorated bodies. Some of the most spectacular burials were found in the cemetery at El-Wad, a site at Mount Carmel in Israel. Almost one hundred Natufian people were buried there, mainly as individuals, although some graves contained several bodies.

El-Wad was one of the first Natufian sites ever found, excavated by Dorothy Garrod of Cambridge University during the 1930s. She was a remarkable figure – the first woman professor at Cambridge University and the leader of several major expeditions to the Near East. She discovered the Natufian culture when excavating in Shukbah Cave in the western flank of the Judaean hills and came to believe that the Natufian people were
farmers – an idea now known to be incorrect. Within the El-Wad cemetery Garrod found some particularly ornate decorations on several of the bodies. One adult male alone had worn an elaborate head-dress, a necklace and a band or garter around one leg, all made with dentalium shells.

Whether such jewellery was worn in life as well as in death remains unclear. The most elaborate jewellery adorned young adults, both men and women – although rather more men than women were buried. It may have denoted social identity, perhaps indicating wealth and power. Much of the jewellery was made from dentalium shells, which could have been gathered from the Mediterranean coast by the Natufian people themselves. But Donald Henry, an archaeologist from the University of Tulsa, USA, who has undertaken extensive studies in southern Jordan, suggests another possibility. He thinks that the shells may have been acquired from hunter-gatherers living in the open steppe of today’s Negev desert in return for cereals, nuts and meat.

For the Natufians, it may well have been control of this trading relationship that provided individuals with wealth and power – and the key to maintaining these may have been to ensure that limited shells were in circulation within their village. The most effective way of doing that was the regular removal of large quantities by burying them with the dead. Those graves were like our gold-filled bank vaults today, designed to ensure that the small amount remaining in circulation – whether of gold or seashells – maintains its value so that it confers status or prestige on the few that have some to own.

The first rays of sunlight through leafy branches dapple the ground; Lubbock wakes to hear footsteps and voices approaching from the woods. Four men and a couple of boys are returning to ‘Ain Mallaha after a hunting trip at dawn. They carry three gazelle carcasses, already gutted and partially butchered but dripping a trail of blood through the trees.

In the village the carcasses are hung within a dwelling, away from the sun and the flies. When roasted, the meat will be assiduously shared between family and friends. The hunters are welcomed back and tell the tale of the kill – how the men had waited in ambush while the boys chased startled animals into a flurry of arrows. There is talk about the various tracks and trails of animals they had seen, and the women learn about any plant foods that appeared ready for collection. Two young women take a wicker basket and leave for a spread of mushrooms that had been seen, hoping to reach them before the deer. Lubbock decides to follow.

All of the Natufian villages shared the same economic base as that of ‘Ain Mallaha. Indeed, all the villages are found in very similar settings – at a juncture between thick woodland and forest steppe, localities likely to have had permanent water supplies, suitable for hunting gazelle and providing edible plants from the two contrasting habitats. Gazelle bones are abundant
in excavations at Natufian sites. Other animals were also taken, such as deer and small game – foxes, lizards, fish and game birds. The gazelle bones reveal more than just the Natufian diet: they show that people probably lived in the villages all year round.

We learn this from the gazelle teeth. Like those of all mammals, gazelle teeth are largely composed of cementum that grows slowly in discrete layers throughout the animal’s lifetime. During the spring and summer, when growth is most rapid, these bands are opaque. During the winter, when growth is restricted, they are black. So by taking a slice through a tooth and inspecting the last cementum band laid down, one can identify whether the animal had been killed in the summer or winter.

Daniel Lieberman, an archaeo-zoologist from Rutgers University, New Jersey, USA, has used this technique to study gazelle teeth from Natufian sites throughout western Asia. At all those he examined, some animals had been killed in the spring/summer and some in the autumn/winter; he took this to mean permanent occupation – or ‘sedentism’ as it is referred to by archaeologists. His findings on gazelle teeth from earlier sites showed that occupation had occurred either during the winter or the summer, reflecting the mobile lifestyle of these hunter-gatherers.

Further lines of evidence support the idea of Natufian sedentism – although some archaeologists strongly believe that the Early Natufian people remained as mobile hunter-gatherers.

It seems unlikely that so much effort would have been expended on the construction of stone houses if they were to be used for only a few weeks or months each year. The many rat, mouse and sparrow bones within the village rubbish are also telling; domestic strains appeared for the first time during the Natufian, and may have evolved to take advantage of the new niche created by permanent human settlement.

This may also have been the case with the dog. The burial of a puppy at ‘Ain Mallaha is the most persuasive sign that wild wolves had evolved into domesticated dogs by the time of the Natufian. Another dog burial comes from Hayonim where three humans and two dogs were carefully arranged together in one grave. These animals were not simply tame wolves but truly domesticated dogs – they were much smaller than their wolf ancestors. All animal species become reduced in size when the domesticated variants arise, as we will see later with sheep, goats and cows.

The first villages would have been attractive to wolves, coming to scavenge on the permanent supplies of waste and for the ready supplies of mice and rats. As such, they would have done a service to the Natufian people by keeping the vermin under control; some animals may have been tamed and used for hunting or as companions for the old and sick. Others may have been used as guard dogs to warn of approaching strangers. When isolated from the wild populations, these tame animals may have rapidly become genetically distinct as the Natufian people controlled their breeding to
ensure the proliferation of some characteristics rather than others. The consequence was a new species entering the world: the domesticated dog.

Not all the Natufian people lived in villages all year round – perhaps none of them did so. Several settlements on the east side of the Jordan valley, such as Tabqa and Beidha, appear to have been used only for brief periods. These have neither dwellings nor burials and seem most likely to be temporary hunting camps, perhaps little different from those that Lubbock saw at Azraq. The people at Beidha had hunted goat, ibex and gazelle, and had dentalium shells from the Red Sea. Whether they spent part of the year in a proper village or lived an entirely transient lifestyle like that of the much earlier Kebaran people, remains unclear.

A dog decides to follow the two young women. It bounds past Lubbock, looking very wolf-like, and soon disappears into the undergrowth. His attempt to follow is soon abandoned as the women walk quickly using a maze of tiny but well-trodden paths that wind between groves of oak and almond trees, past clusters of lupins and thickets of hawthorn. Lubbock loses their trail and finds himself in more open woodland close to marshes that border the lake of the Hula basin. The paths continue and patches of cultivated plants are found in the under-storey of the oak trees. These include tangled peas and wild wheat with heavy drooping ears of grain. Lubbock sits by one such stand to rest, hearing the dog barking from afar.

Tame dogs, whether treated as pets or kept as working animals, are rather like children. They need to be cared for and can become the subject of intense relationships: dogs were as much ‘man’s best friend’ in the Natufian as they are today. This caring attitude to animals may have spilled over on to the plants gathered by the Natufian people. We should not think of them collecting cereal grains, picking fruit and gathering nuts in bland economic terms – with no concern other than to maximise their immediate yields for the minimum of effort. No hunter-gatherer groups recorded by anthropologists have been like that, and there is no reason to think that they were so in prehistory.

The Bushmen of South Africa, the Aborigines of Australia and the Indians of Amazonia have all displayed immense and intimate knowledge about the plants around them, even those that have no economic value. Parts of roots and clusters of seed-heads are often left in the ground to ensure that there will be plants to gather at the same location in the following year. Fire has frequently been used to burn off old stems and encourage the growth of new shoots.

Christine Hastorf, an archaeologist from Berkeley, California, stresses the significance of ‘plant nurturing’ in understanding the earliest stages of plant domestication. She reminds us that with very few exceptions plants have been gathered and cultivated by women who have often applied the same attitudes and care for the plants in their gardens as they do to the children.
within their houses. The Natufian women may have been like those of the Barasana people of northwest Colombia who maintain ‘kitchen gardens’ close to their dwellings. Most of their garden plants are wild species but are nevertheless nurtured for use as food, medicines, contraceptives and drugs. The Barasana frequently exchange cuttings with their friends and relatives so that each plant added to the garden comes with a story that serves to maintain social links. Moreover many plants have symbolic meanings associated with the origin myths of the Barasana people. In the words of Hastorf, ‘To walk through a [Barasana] woman’s garden is to view her daily life, her ancestral lineage and a history of her family’s social relations.’

Any gardener today will understand this: in my own suburban garden, for instance, my wife has plants that have been given as gifts, plants that mark where our deceased pets have been buried, plants that we have uprooted and taken with us from garden to garden as we have moved during the last twenty years. Every year my wife meticulously collects marigold seeds to resow the next. Many years ago her grandmother had given her seeds from marigolds that she had herself collected and resown each year throughout her long life.

We have no knowledge of how the Natufian people thought about the plants around them. But in light of the permanence of their settlements, the many mouths needing to be fed, and the abundance of grinding stones, pestles and mortars, wild plants appear to have been managed in a way that we would recognise as cultivation. I suspect that the stands of wild cereals, the groves of nut trees, the patches of lupins, wild peas, and lentils were treated as a wild garden, and that these were manipulated and managed, used in social relations and infused with symbolic meanings, just like the plants in the kitchen gardens of the Barasana. Dorothy Garrod may have been wrong to think of the Natufian people as farmers; but they were most certainly rather special gardeners.

In this regard some artefacts from Natufian sites take on added significance because they may actually depict the gardens themselves. At Hayonim a rectangular slab of limestone, about 10 by 20 centimetres, was incised with lines that divide the surface into distinct areas. Ofer Bar-Yosef and Anna Belfer-Cohen, a specialist on Natufian art from the Hebrew University in Jerusalem, propose that this pattern ‘can be viewed as designating definite territories or “fields” of some kind,’ perhaps separated by tiny paths. This slab is not unique; others have similar designs and while they may not be spatially accurate maps of fields or gardens, they may represent these in some abstract form – just like the map of the London underground.

John Lubbock spends the morning reading Prehistoric Times and bird-watching in the Natufian world of the Hula basin. After the sun had climbed to burn off the few wispy morning clouds a pair of vultures circled in the clear blue sky; a flight of geese arrived on the lake and then song-birds
landed on the wild wheat to feed upon the grain. Just as Lubbock decides to return to 'Ain Mallaha, a party of women arrive and stand right beside him to inspect the wheat. They curse a little as it has ripened more quickly than expected and they know that much will now be lost. Within minutes the women are at work, cutting the stalks with the flint-bladed sickles that Lubbock had seen dangling within dwelling 131. They cut the stalks at their base to acquire straw as well as grain; just as they had feared, the ears shatter when touched, scattering many of the spikelets – the seed with its long spike attached – to the floor. Working quickly, they gather up the bundles of stalks and ears and tie them into sheaths.

Back at the village, the ears are beaten into wooden bowls to release the remaining spikelets; red-hot stones are added and swilled around. Lubbock gathers that this parches the spikelets and turns them quite brittle. Next they are emptied into wooden mortars and crushed to release the grain; the mortars are emptied on to bark trays that are agitated to separate and discard the chaff. The grain goes back into the mortars and is now finely ground into flour; after being mixed with water and made into dough, it is cooked as flat bread-pancakes upon the hot stones, no more than a few hours after growing within the wild gardens of 'Ain Mallaha.

We know that the Natufian people were cutting the wild cereals with sickles. In the light of their decorated handles, this might have been an activity infused with symbolic meaning, just as picking marigolds is for my wife. Cutting with sickles would have been much more efficient than beating the grain into baskets because it reduced the amount falling uncollected to the ground. Another impact of this new harvesting method remained unknown to the Natufian people: cutting with sickles laid the foundations for the transition from the wild to the domesticated forms.

Recall that the principal difference is the brittleness of the ear – the wild strains spontaneously fall apart when ripe, scattering their seed on the ground while the domestic strains remain intact, ‘waiting for the harvester’. Within the stands of wild cereals there would always have been a few plants that were relatively non-brittle – rare genetic mutants, estimated by Gordon Hillman as numbering one or two for every 2–4 million brittle individuals.

Those beating the stalks and catching the grain in baskets held below would not have collected it from such genetic mutants. Only when cut by sickles would the grain from these have been collected along with that from the normal brittle plants. Imagine a situation in which a small party of Natufians arrived to begin cutting a stand of wild cereals. If the wheat or barley was already ripe, then much of the grain from the brittle plants would already have been scattered. But the rare non-brittle plants would still be intact. So when the stalks were cut, the grain from those plants would have been relatively more abundant within the harvest than it had been in the woodlands or on the steppe.
Now imagine what would have happened if the Natufian people began to reseed the wild stands of cereals by scattering grain saved from a previous harvest, or perhaps sowing it into holes made with a stick or even into tilled ground. That seed grain would have had a relatively high frequency of the non-brittle variants. When the new stand was cut with sickles, the non-brittle variants would have been favoured once again and hence gained an even higher presence within the harvested grain. If this process had been repeated many times, the non-brittle plants would gradually come to dominate. Eventually they would be the only type of plant present – the domestic variant that ‘waits for the harvester’ would have arisen. But if abandoned, the domestic strain would gradually disappear; being unable to seed itself new genetic mutants – those with brittle ears just like the original wild plants – would be the only ones able to reproduce and would rapidly come to dominate the stand once again.

Gordon Hillman and Stuart Davies, a biologist from the University of Wales, have used their knowledge of plant genetics and ancient gathering techniques – much of it acquired by experimentation – to estimate how long the change from wild to domestic strains would take. By using computer simulation they showed that in ideal circumstances as little as twenty cycles of harvesting and resowing in new patches could have transformed a wild, brittle type of wheat into the domesticated non-brittle variant. Under more realistic conditions, 200 to 250 years is the most likely period of transition.

The archaeological evidence makes it clear that this transition did not happen during the Natufian. There are microscopic differences between the shape of the grain from domestic cereals and wild varieties, and although cereal grains are rare in the Natufian archaeological record all of those known are clearly from wild cereals. Not for another millennium at least do we encounter the first domesticated grains – from the settlements of Abu Hureyra and Tell Aswad in Syria, and Jericho in Palestine. So the Natufian people appear to have cut the wild cereal stands with their sickles for as much as 3,000 years without the evolutionary leap from brittle to non-brittle plants.

There seems to be a very simple explanation for this, identified in some remarkable research by Romana Unger-Hamilton during the 1980s while she worked at the Institute of Archaeology in London. Under the guidance of Gordon Hillman she spent many months replicating the Natufian style of harvesting wild cereals. Using identical sickles made with bone handles and flint blades, she cut stands of wild wheat and barley on the slopes of Mount Carmel, around the Sea of Galilee and in southern Turkey in a series of controlled experiments. The blades were then microscopically examined for signs of ‘sickle-gloss’ – the texture, location and intensity of gloss will vary with different types of cereals and at different stages of ripeness.
Unger-Hamilton found that the sickle-gloss on the true Natufian blades was most similar to that on the blades she used to harvest cereals that were not yet ripe. In that state, the brittle plants would have shed only a little of their grain, so that it would be collected from the non-brittle variants in virtually the same minute proportion as from those plants within the stand. So even if the Natufian people were sowing seed to generate new stands of wild cereals, non-brittle variants were unable to become dominant. Harvesting the unripe ears was perfectly sensible as it avoided the loss of most of the grain from the brittle plants, which would have already been shed to the ground.

Another factor probably prevented the emergence of domesticated cereals among the Natufians: their sedentary lifestyle. Patricia Anderson, of the Jales Research Institute in Paris, undertook a similar programme of research to that of Romana Unger-Hamilton and confirmed many of her results. She also found that when wild stands are cut with sickles, even when still in a ‘green’ stage, the grain that falls to the ground is quite sufficient to provide for the next year’s crop. So the Natufians would have only needed to sow if they were beginning a brand-new plot of cereals – otherwise they could have relied upon ‘growback’ at the existing stands. Even if the grain collected by the Natufian people did have a higher proportion of the non-brittle variants, unless they were creating new plots of cereals in new places these variants would never have had the opportunity to become the dominant form. And as the Natufian people were sedentary, new plots were never made. The Natufians remained as cultivators of wild cereals within the wild gardens of the Mediterranean woodland.

These arguments about the Natufian people, their wild gardens and their plant-gathering activities have one obvious weakness: very few botanical remains have been recovered from their settlements. This is partly due to poor preservation and partly because many excavations predated modern recovery techniques. For direct evidence of the nature of plant-gathering at 12,000 BC John Lubbock has to leave the Mediterranean woodland and the Natufian culture. He has to travel 500 kilometres to the northeast to another hunter-gatherer village, one found on the flood plain of the Euphrates: the astonishing site of Abu Hureyra.
On the Banks of the Euphrates

Abu Hureyra and the rise of hunter-gatherer sedentism,
12,300–10,800 BC

The grass and flowers of the steppe are wet with dew as John Lubbock approaches the village of Abu Hureyra. It is dawn on a midsummer’s day in 11,500 BC. His journey from ‘Ain Mallaha took him from the dense oak forests of the Mediterranean hills, through open woodland and finally into the treeless steppe, into what is northwest Syria today. He passed several villages close to rivers or lakes, all unknown to the modern world. Now he pauses for the view – in the distance there is a plain, beyond which a line of trees borders a wide-flowing river, the Euphrates. Beyond that there are no more than shadowy horizons in the misty light of the breaking day.

Another few minutes of walking brings the village into view; but it requires a double take. It blends into its sandstone terrace just as ‘Ain Mallaha blended with its surrounding woods, seeming to have been grown by the sun and moulded by the wind rather than constructed by human hands. With every step the low and flat reed-covered roofs clustered by the rim of the flood plain become a little clearer. Even so, the boundary between nature and culture remains deeply obscure.¹

The people of Abu Hureyra are sleeping. Dogs are sniffing each other and the ground, some scratching and some chewing at bones. The roofs are at waist-height, supported on the small wooden frames of dwellings cut into the soft stone.² Lubbock steps down into one and finds a small, cramped, circular room little more than 3 metres across. A man and a woman sleep on hides and a mattress of dry grass; a young girl does likewise upon a bundle of hides.

The floor is littered with artefacts and rubbish – not pestles and mortars as at ‘Ain Mallaha but flat and concave grinding stones. Chipped stone artefacts are scattered across the floor, along with wicker baskets and stone bowls, and even a pile of animal bones crawling with flies. One small bowl contains tiny crescent-shaped microliths made of flint, much like those at ‘Ain Mallaha. One side of the dwelling contains a pile of dirt – the wall has crumbled and soil fallen in from outside. There is a nauseating smell of rotting meat and stale air.

Much of village life occurs beyond these walls – they do not enclose houses as we think of them today. In the outside spaces there are cooking places, piles of sticks, bundles of reeds, sheets of bark, and clusters of
grinding stones. Evidently many people work together in preparing the plants gathered from the wild gardens on the steppe and the marshy woodland by the river's edge. Lubbock stoops and lets the multicoloured husks, stems, twigs and leaves that surround the stones filter through his fingers. These are the waste, left precisely where they fell from the grinding stones or were stripped from the gathered bundles of plants and flowers. Near by there are baskets and stone bowls brimming with nuts and seeds of assorted shapes and colours.

Elsewhere in the village Lubbock comes across a further cluster of grinding stones; but these are surrounded by lumps of red stone and powder instead of seed husks and plant stems. The grinding stones are stained red from making pigment that is used for decorating human bodies. Close by, three gazelles have been gutted but have yet to be butchered; their carcasses are left hanging beyond the reach of dogs. The Abu Hureyra people are as dependent upon hunting gazelle as on gathering plants. But such animals are only principally hunted for little more than a few weeks each summer when vast herds pass by close to their village.

Daily life at Abu Hureyra begins. The gazelle do not appear and the hunters leave to search the river valley for wild pigs and wild ass. Few animals now live in the vicinity of the village so the hunters will be disappointed. The women and children work in the wild gardens, weeding, killing bugs and collecting whatever has ripened in the sun.

Within days the herds arrive and the annual slaughter of gazelle begins. Visitors are welcomed to the village. They bring shiny black obsidian from southern Turkey as gifts and receive dentalium shells in return, shells that had once been collected on Mediterranean shores and were brought by previous visitors to Abu Hureyra.

For more than a thousand years the hunter-gatherers at Abu Hureyra will continue to hunt the gazelle. The animals are so numerous that their slaughter has no impact on the size of the herds. The women and children will continue to tend their wild gardens and reap a rich harvest. The accumulation of dirt, sand, lost artefacts and other debris within the dwellings will become either unbearable or simply make access impossible. And then the Abu Hureyra people will build new dwellings, this time totally above the ground. But eventually hard times will arrive. The drought of the Younger Dryas will disrupt the gazelle and decimate the productivity of the steppe. The village will be abandoned, the people returning to a life on the move.

At 9000 BC they will return, not as hunter-gatherers but as farmers. They will build mud-brick houses and grow wheat and barley on the alluvial plain. The gazelle herds will have resumed their migrations and be hunted for another thousand years until the Abu Hureyran people suddenly switch to herding sheep and goats. The houses will be repeatedly rebuilt so that a
mound — or tell — is formed, half a kilometre across, 8 metres deep and containing more than one million cubic metres of deposits. The remnants of the first subterranean dwellings at Abu Hureyra will be deeply buried and lost from human memory.

In 1972 the archaeologist Andrew Moore excavated part of the tell. As it was a salvage operation before dam construction, his work was limited to two seasons. Today the tell lies drowned beneath the waters of Lake Assad. In the small area that he could excavate, Moore found several dwellings and rubbish tips of the earliest inhabitants of Abu Hureyra. There was no sign of a cemetery or indeed of any burials. This left him in a quandary. What had they done with their dead, and were there the same differences in wealth as had been evident at ‘Ain Mallaha?

Nevertheless, within those two seasons of work a wealth of information was acquired about the village. It was one of the first excavations to employ methods to ensure that even the tiniest and most fragile plant remains were recovered. These included ‘flotation’ in which charred seeds are literally made to float away from the sediment that encased them, and then scooped off and prepared for study. Gordon Hillman found that no less than 157 different species had been brought to the village, and suspected that at least another hundred species had been collected but left no archaeological trace.

He was able to pinpoint at least two seasons of collection: from spring to early summer and the autumn. But he thinks the people remained in their village all year round; where else would they have gone in the winter when conditions in the steppe and surrounding mountains would have been bleak? In the high summer the most critical resource was probably water from the valley. By staying at Abu Hureyra they could have enjoyed plant foods that reached their prime in the summer, such as the tubers from club-rush and nut-grass — although neither was found in the archaeological remains.

Peter Rowley-Conwy and Tony Legge, two of the most prominent archaeo-zoologists in the United Kingdom, have studied the annual gazelle slaughter. From two tons of bone fragments, they showed that only adults, the newborn and yearlings had been killed. This pinpointed the slaughter as taking place during the early summer: only at that time of year would this specific range of ages have been present.

This remarkable work by Moore, Hillman, Rowley-Conwy, Legge and many other archaeologists shows that the hunter-gatherers of Abu Hureyra enjoyed the most attractive environmental conditions that had existed for many thousands of years, since long before the LGM. At no other times had animals and plants been so abundant, so diverse and so predictable in their availability — just as they were for the Natufian inhabitants of the Mediterranean woodlands. This provided them with the opportunity to give up the mobile lifestyle that had served human society since its first appearance 3.5 million years ago on the African savannah. But why do it?
Why create the social tensions that inevitably arise when one has permanent next-door neighbours within a village? Why expose oneself to human waste and garbage and the health risks that accompany a more sedentary lifestyle? Why risk the depletion of the animals and plants near one's own village?

We can be almost certain that people were not forced into this lifestyle by over-population. Natufian sites are no more abundant than those of the previous times; if there had been a time of population pressure it was at 14,500 BC when there is a dramatic increase in the number of Kebaran sites and the standardisation of microlith forms. There is no evidence for a population increase two millennia later when the first Natufian villages appear. Moreover, from the evidence of their bones, the Natufian people were reasonably healthy – quite unlike a people being forced into an undesirable lifestyle by shortage of food.

Anna Belfer-Cohen of the Hebrew University in Jerusalem has studied the skeletal evidence and found very few signs of trauma, such as healed fractures, nutritional deficiencies or infectious diseases. People under stress tend to develop thin lines in their tooth enamel – called hypoplasias. These indicate periods of food shortage, often immediately after weaning. The lines are less frequent in Natufian teeth than in those of farming people. But both Natufian teeth and those of early farmers are heavily worn down. This confirms the importance of plants in their diet: when seeds and nuts were ground down in the stone mortars, grit would have become incorporated in the resulting flour or paste. And when the food was eaten, this grit abraded the teeth, often leaving them with hardly any enamel at all.

The Natufian people appear to have been quite peaceable as well as healthy. There are no signs of conflict between groups, such as embedded arrow points in human bones – unlike the situation that Lubbock will find on his European, Australian and African travels. The Natufian hunter-gatherer groups were good neighbours; there was plenty of land, gardens and animals for all.

It is possible that the Natufian and Abu Hureyran people were prepared to suffer the downside of village life – the social tensions, the human waste, depletion of resources – to enjoy the benefits. François Valla, the excavator of 'Ain Mallaha, believes that the Natufian villages simply emerged from the seasonal gatherings of the Kebaran people. He recalls the work of the social anthropologist Marcel Mauss who lived with hunter-gatherers in the Arctic at the turn of the century. Mauss recognised that periodic gatherings were characterised by intense communal life, by feasts and religious ceremonies, by intellectual discussion, and by lots of sex. In comparison, the rest of the year, when people lived in small far-flung groups, was rather dull.

Valla suggests that the aggregation of mobile hunters and gatherers prior to the Natufian may have been similar, and the Natufian people simply had
the opportunity to stretch out those periods of aggregation, until they effectively continued for the whole year. Indeed, all the key elements of the Natufian villages were already present at Neve David: stone dwellings, grinding stones, dentalium beads, human burials and gazelle bones. As the climate became warmer and wetter, plants and animals more diverse and abundant, people stayed longer and returned earlier to their winter aggregation sites until some people remained all year round.

The sedentary hunter-gatherers at ‘Ain Mallaha, Abu Hureyra and indeed throughout western Asia between 12,500 and 11,000 BC were enjoying the good life. The wealth of the archaeological evidence and the excellence of the research allows us to capture in our minds some vivid images of that life. We can readily imagine the acorns being carried in baskets to ‘Ain Mallaha, and then being pounded to a paste, the Abu Hureyrans catching their first sight of the approaching gazelle, and the dressing of a dead man with a dentalium shell head-dress, necklace and leg band at El-Wad ready for burial.

But the image to remember is of a few families enjoying a day within the forest steppe – away from the barking dogs, the smelly rubbish heaps, the grumpy stay-behinds of their village. They are neither searching for game nor collecting plants. It is a day of rest and I see them sitting surrounded by a myriad of summer flowers. Children are making garlands while young lovers sneak off to the long grass. Some talk, others sleep. All enjoy the sun. They have full stomachs and no worries.

John Lubbock sits with them, after a few days spent living and working at Abu Hureyra. He reads his book, discovering what his namesake had known about climate change – very little. Victorian John Lubbock appreciated that immense alterations of climate had occurred because he had visited caves packed with reindeer bones in sunny southern France, found oak trees within peat bogs and seen valleys cut by ancient rivers. But in 1865 there had been no awareness of the complexity of climate change, the idea of multiple glaciations only gaining favour in the early twentieth century, and key events such as the Younger Dryas remaining unknown until recent times. Nevertheless modern John Lubbock was impressed with his namesake’s book, especially when he read that the suggested causes of climatic change included variation in solar radiation, alteration in the earth’s axis and changes in ocean currents – all of which have since been proved and remain at the forefront of scientific study.⁸

For a while Lubbock forgets his place in history; the butterflies, the flowers, the sun and the breeze are quite timeless. But the date is 11,000 BC and a dramatic change in the climate is about to happen; the families sitting on the steppe unknowingly teeter on the edge of an environmental calamity: the Younger Dryas is about to arrive.

For generation after generation since the LGM, life for the people of
western Asia had been getting better and better. Ups and downs had occurred: years of relatively cold and dry weather when plant foods and game had been more difficult to find, years when these had been particularly abundant. But the trend was towards a warmer and wetter climate, a greater diversity of plants, increased yields of seeds, fruits, nuts and tubers, larger and more predictable animal herds, and a richer cultural and intellectual life. This had culminated in the village life that Lubbock has seen at 'Ain Mallaha and on the banks of the Euphrates. The families from Abu Hureyra enjoying the summer sunshine on the steppe were certainly the lucky ones and they probably knew it. But they could not have known quite how lucky they were. For within a few generations the tide of climate change had turned and life was never quite so good again.
Once again John Lubbock stands on the west bank of Lake Hula and looks across to the village of ‘Ain Mallaha. Fifty generations, 1,500 years, have passed since he watched vibrant activity within the village amidst the oak, almond and pistachio. Times have changed. The woodland is sparse. The trees and undergrowth lack the luscious growth that had seemed to cosset the people of ‘Ain Mallaha with a promise of abundant food. Within the village, roofs and walls have collapsed and some dwellings are no more than piles of rubble. There are new circular structures, but these are small ramshackle affairs.

Fifty kilometres to the southwest, the village of Hayonim has been abandoned altogether. After two hundred years of occupation, people left the cave to live on the terrace, using their previous dwellings for the burial of their dead. But even those new houses are now deserted. Brambles and weeds, snakes and lizards, lichens and moss are the only residents as nature begins to reclaim its stone, welcoming the limestone walls, the basalt mortars, and the flint blades back within the earth. Abu Hureyra is the same – the people gone, empty dwellings left to crumble, artefacts abandoned and forgotten.

The date is 10,800 BC. Sedentary village life exists only in the stories, passed from generation to generation, of people who live in transient campsites scattered throughout the struggling woodland and the now desert-like steppe. The cultural achievement of the Natufian remains as no more than a faint echo in the artefacts, the dress and the social customs of these people – people whom archaeologists refer to as the Late Natufians. Many of them periodically meet together at ‘Ain Mallaha, El-Wad or Hayonim, bringing the bones of their dead to rebury alongside their ancestors at what have become sacred sites existing in that nether world between history and myth.

The experiment of sedentary village life lasted for close on two thousand years but ultimately failed, forcing people to return to a more ancient peripatetic lifestyle. Before so doing, Natufian culture had spread far beyond the Mediterranean woodlands claimed by Ofer Bar-Yosef to have been its ‘homeland’. The signature of this culture – the crescent-shaped microliths
became widespread throughout western Asia, with Late Natufian settlements appearing all the way from the southern deserts of the Arabian peninsula to the banks of the Euphrates.

The spread of Natufian culture suggests that the sedentary villages were partly victims of their own success. Their inhabitants are likely to have grown in number unremittingly. Mobile hunter-gatherers have a natural constraint on their numbers as they have to carry not only their possessions but also their youngest as they move from site to site. Childbirth must be spaced at three- to four-yearly intervals as it is not possible to carry more than one child at a time. The Natufian residents of 'Ain Mallaha, Hayonim and other villages were able to reproduce more freely.

It seems likely that the spread of Natufian culture arose partly from groups of people leaving their villages to establish new settlements. This may have been the only way that ambitious young men and women could gain power for themselves. But another reason for dispersal also presents itself: there was no longer enough food to go round. Late Natufians heading into the Negev desert to establish villages such as Rosh Horesha and Rosh Zin, or those close to the Mediterranean coast as at Nahal Oren, or at settlements such as Mureybet on the banks of the Euphrates, may have been some of the original economic migrants.

The village people had begun to over-exploit the wild animals and plants on which they relied. The gazelle bones from their rubbish heaps provide a telling story about attempts to manage the herds that ultimately backfired and led to a shortage of food. Carol Cope, from the Hebrew University in Jerusalem, has made meticulous studies of the gazelle bones from Hayonim and 'Ain Mallaha. The mountain gazelles hunted from these villages behaved quite differently to those hunted at Abu Hureyra. They remained in the vicinity of the Natufian settlements all year round, never forming the massive herds that were ambushed near the Euphrates.

Cope found that the Natufian people preferred to kill the male animals. This was evident because the foot bones (the *astragali*) she studied were easily divided into two groups on the basis of size, with the larger bones outnumbering the smaller by four to one. Big feet imply big bodies, and for gazelle those bodies would have been male.

When the Kebaran people had used Hayonim Cave, five thousand years before the Natufian became established, they killed male and female gazelles in equal proportion. By preferentially selecting the males, the Natufians were probably attempting to conserve the gazelle populations. Although both sexes were born in equal proportions, only a few male animals were actually needed to maintain the herds. Carol Cope thinks that the Natufian people decided that the males were expendable while recognising the need to ensure that as many females as possible gave birth to young.

If this was their aim, it went horribly wrong. The Natufians made the
mistake of not just hunting the males, but selecting the biggest that they could find to kill. So the female gazelles were left to breed with the smaller males – unlikely to have been their natural choice. As small fathers give rise to small offspring, and as the Natufians killed the largest offspring, the gazelles reduced in size with each generation. Hence the gazelle bones found in the rubbish dumps of Hayonim Cave were from animals much larger than those from the rubbish dumps on the terrace – the two being five hundred years apart.

Smaller gazelles meant that there was less meat available to feed an ever-growing population. This shortage was compounded by over-exploitation of the ‘wild gardens’: too many stalks of the wild cereals had been cut and excessive quantities of acorns and almonds had been collected for natural replenishment to occur.

The health of the Natufian people began to suffer, especially that of the children. This is evident from their teeth. Those from the Late Natufian people buried at Hayonim have a much higher frequency of hypoplasias than their Early Natufian predecessors. They also had fewer teeth remaining when they died, and those teeth that survived had caries – two further signs of poor health.

Food shortages can also lead to poor physical growth – as is evident among famine victims today. This might explain why many of the Later Natufian people, such as those buried at Nahal Oren, were shorter than those who had first lived at ‘Ain Mallaha. Just as in the modern world, the men were affected more than the women, and so the Late Natufian sexes were more similar in body size than had once been the case.

Food shortages within the Natufian villages, leading to emigration and eventual abandonment, cannot be blamed solely on the Natufian people themselves, on their failure to control their own numbers. The problems of population growth are likely to have been eclipsed by something over which people had no control at all: climatic change.

The Younger Dryas, one thousand years of cold and drought, was triggered by the massive influx of glacial melt waters into the North Atlantic when the North American ice sheets collapsed. Its impact on the landscapes of western Asia is readily seen in the pollen grains from the Hula core. The sediments laid down within that lake after 10,800 BC show a dramatic reduction in the quantity of tree pollen, indicating that much of the woodland had died through lack of rain and warmth. Indeed, within five hundred years conditions little different to those of the LGM had returned: a devastating collapse of food supplies just as population levels had reached an all-time high.

With the double-whammy of population pressure and climatic deterioration, we should not be surprised at the collapse of Early Natufian village life. But people could not simply return to how their Kebaran forebears had lived. Not only were population numbers substantially greater but the Late
Natufian people had a legacy of sedentary life: new technology, new social relationships, new attitudes to plants and animals, new concepts about land and dwellings, perhaps even those about ownership and property.

There could be no turning back from such ideas, even though people had returned to the ancient lifestyle of transient campsites and weary feet.

Before we follow the story of the Late Natufian people of the Jordan valley and return to Lubbock’s travels, we must make a brief visit 1,000 kilometres to the east. This takes us beyond the now deserted village of Abu Hureyra, beyond the Euphrates and into the foothills of the Taurus and Zagros mountains. Here, rather than villages being abandoned during the Younger Dryas, they were created for the very first time.

The Zagros region has ill-defined boundaries and is topographically diverse; it includes the upper part of the Mesopotamian plain, rolling hills, deep valleys, crags and mountain peaks. The changes in exposure and altitude created dramatic differences in the extent of rainfall and temperature, producing many localised pockets of lush vegetation even when the general conditions were cold and dry.

Throughout the whole region temperatures fell and rainfall diminished, knocking out many of the trees that had recently spread from the Mediterranean coast. But the sheltered lowland valleys provided a refuge for copses of oak, pistachio and tamarisk, as well as for game animals forced down from the now bitterly cold higher slopes.

The hunter-gatherers had to follow the plants and animals and settle within those valleys at much higher densities than when they roamed widely across the hills. Within these valleys they built some of the most elaborate architecture yet seen in the history of the world. Hallan Çemi Tepesi, found on the banks of a small river in the foothills of the Taurus Mountains, is the most intriguing of these new villages. In 1991 the archaeological site was threatened by dam construction. A joint American and Turkish team undertook excavations, they found traces of structures with stone foundations and wattle-and-daub walls. Precisely when these had been built remains unclear; the few radiocarbon dates span more than two thousand years but the major period of occupation seems to have been around 10,000 bc. The people at Hallan Çemi Tepesi had gathered a wide variety of plant foods including almonds, pistachios, plums and pulses. They hunted wild goats, deer and wild boar.

Some of the structures were domestic dwellings containing hearths, grinding stones and utilitarian artefacts. But others had figurines, decorated stone bowls and obsidian that had originated 100 kilometres to the north. Domestic tasks had been excluded from these structures, reserving them for social or ritual activity.

Decorated stone bowls were made from fine sandstone; some had flat bases while others were rounded, with pierced sides for suspension across a
fire. Many were decorated with incised hashes, zigzags and meanders. Some had animal images – a line of three dogs parades along the surface of one vessel. A number of the pestles had been highly polished; one had its handle carved into a stylised goat’s head. Many beads were found, coming in a variety of shapes and sizes and made from coloured stones. So-called figurines were made from the same white stone used for making bowls.

Hallan Çemi Tepesi appears far too substantial for a seasonal hunter-gatherer camp; considerable labour had been invested in the buildings, and the larger stone vessels had evidently been made as fittings. The highly developed material culture and obsidian trade suggest a society as complex as that which had flourished at ‘Ain Mallaha – and perhaps one even more immersed in a world of symbols and ritual. John Lubbock will only discover the consequence of these developments much later in his travels – when he arrives in Mesopotamia in 11,000 BC after having journeyed almost entirely around the world.

Archaeologists are still struggling to understand the new lifestyle that the Late Natufian people of the Jordan and Euphrates valleys adopted during the Younger Dryas. A telling source of evidence is their burial practice, and how this had changed from those of their village-based ancestors. Perhaps the most striking development is that people were no longer interred wearing elaborate head-dresses, necklaces, bracelets and pendants made from animal bones and seashells. The fact that about a quarter of the Early Natufians had been buried in this fashion suggested that some had been much more wealthy and powerful than others.

Wealth and power had evidently been dependent on sedentary village life. This provided an elite with the opportunity to control the trade that brought seashells and other items to the villages. A return to mobile lifestyles swept away their power base and society became egalitarian once again, much as it had been in the Kebaran period. The absence of seashells adorning the dead was not because such shells were no longer available – they are found in abundance in Late Natufian settlements. Rather than being placed with the dead they were simply discarded with the domestic rubbish, along with bone beads and pendants. The shells had lost their value because there was no longer any control over their distribution – mobile hunter-gatherers were able to collect seashells for themselves and trade with whom they wished.

Another sign of a return to a more egalitarian society was a switch from burying people predominantly in groups – probably as members of a single family or lineage – to individual interments. Evidently family membership no longer held the same significance – people were valued on the basis of their accomplishments and personality, rather than their blood ties. But it is a third change in burial practices that is the most telling about changing society during the Natufian. A large proportion of the Late Natufian burials
are of jumbled collections of bones, or of a skeleton with parts missing—frequently the skull.

These are known to archaeologists as secondary burials. They show that funeral rites were far more than the single event of placing a body into a grave and leaving it there. Instead there were at least two, perhaps several, stages to the burial ritual—most likely culminating when many groups gathered together for the final passing of the dead.

It is an autumn day in 10,000 BC. Dusk falls across Lake Hula, seemingly announced by a flight of geese. John Lubbock settles down close to his small fire, happy to watch the darkness descend and for sleep to arrive. But within minutes he is disturbed by human voices coming from a travel-weary party who pass by on their way to ‘Ain Mallaha. Some are old and walk with sticks; some are young and carried by weary parents. Loud barks come from the dilapidated village, answered with little more than muted yelps by the dogs that travel with these people. To the dogs, ‘Ain Mallaha will be just another of many settlements visited in the course of a year. But to the people it is a place with no equal—it is their ancestral home and this is their first visit for many years.

Their journey has taken them to several of their temporary camps—sites abandoned when the local game and plants had become too depleted to sustain their presence. They visited places where people had died and been buried. At each grave, bones were exhumed and placed in baskets to be taken to ‘Ain Mallaha. From some, they took near-complete skeletons held together by dried skin and tendons; from others, just the skull. Whenever they rested on their journey, the old recalled the visits that their fathers and grandfathers had made to ‘Ain Mallaha, bringing the bones of their own dead for reburial. The young listened eagerly. They knew the stories by heart: how their ancestors had dwelt at ‘Ain Mallaha all year round; how there had been an abundance of food; how they had adorned their bodies with elaborate jewellery and clothes; how the wolf had become the dog.

Lubbock joins the party and enters the village of ‘Ain Mallaha where respectful and formulaic greetings are made with the handful of people who live in the ramshackle dwellings and guard the site. The baskets and the few belongings they carry are laid to rest. A fire is lit and a little food shared before sleep claims them all.

During the next few days three more groups arrive at ‘Ain Mallaha, each bringing baskets with the bones of their dead. Almost one hundred people have now gathered together, ready to relive the ancestral past. Two further days pass by while the woods are scoured for game and plant foods for the feasts. Stories are retold, and then retold again.

Lubbock helps with the clearance of debris from one of the collapsed dwellings: boulders, brambles, rotting timbers and the earth. The ancient
cemeteries of 'Ain Mallaha are reopened. Amid singing and chanting, the bones of the new-dead are removed from their baskets and placed within the ground. By doing so, the past and present are joined as one. The act of reburial, the days of celebration that follow, the community life, storytelling and feasting recreate for the living the days of the ancestral past. The challenge of the present – the struggle for survival during the severity of the drought-ridden Younger Dryas – is momentarily forgotten.

The people remain at 'Ain Mallaha for as long their food supplies allow – ten days, perhaps two weeks at most. They talk endlessly about where they have been, who they have seen, and what the future might hold. They exchange gifts: stones, shells and, most intriguing of all, leather pouches of cereal grain, peas and lentils.

Finally the groups depart and go their separate ways, each having gained some new members and lost others. They are all grateful for the return to their transient lifestyle within the arid landscapes of the Mediterranean hills, the Jordan valley and beyond. It is, after all, the only lifestyle they have known and it is the one that they love. Lubbock has grown to love it too, especially when in the company of these people who have a tale to tell about every valley and every hill, every pool of water and every grove of trees. He joins a party that sets off walking towards the southeast, heading for the Jordan valley. Bags of seed dangle from their waists and swing like pendulums, seemingly conscious of time itself, knowing that there is little left for those who hunt and gather for their food.

There is no direct archaeological evidence that the Late Natufian people carried bags of cereal grain, lentils and peas. But if they had done so, and then scattered the seed when arriving at their autumn camps and gathered the summer harvest before moving on to live elsewhere, it would explain how domesticated wheat and barley evolved.

Patricia Anderson's experimental work has shown that the reseeding of existing stands – as the Early Natufians may have done – would have made little difference to the proportion of the non-brittle variants due to the amount of grain already in the soil. What was needed for domestication to occur was that brand-new plots of cereals, peas and lentils were regularly sown and harvested, and this is just what many Late Natufian people are likely to have done. But what could have caused them to do so?

We know that times were hard in the increasingly arid landscapes of the Younger Dryas, but quite how hard remains unclear. The droughts certainly caused many ponds and rivers to disappear completely, and the larger lakes to shrink in size. The people who lived in the south, in today's deserts of the Negev and Sinai, were most likely hit the hardest. They returned to a completely transient hunter-gatherer way of life, one much like that of the Kebaran people. Survival required improved hunting weapons: game had become scarce and consequently success had become essential when a kill
was possible. And so we see the invention of the Harif point – a rhombic-shaped arrow-head.\textsuperscript{12}

Further north, the impact of the Younger Dryas may have been less severe. Yet survival still required more than just a return to the ancient mobile hunter-gatherer lifestyle, especially as there were many more people now needing food than had been the case during the Kebaran period, before the Early Natufian experiment with permanent dwellings. One response was to hunt a much wider range of animals than before; and hence we find on Late Natufian settlements the bones of many small-game species as well as the ever-present gazelle.\textsuperscript{13}

Another response was to continue, and perhaps expand, the cultivation of plants. Wild cereals were particularly hard hit by the Younger Dryas owing to a decrease in the concentration of carbon dioxide (CO\textsubscript{2}) in the atmosphere.\textsuperscript{14} This diminution, carefully documented from air bubbles trapped in the Antarctic ice, inhibited their photosynthesis and markedly reduced their yields. Consequently, whatever cultivation practices had begun during the Early Natufian – weeding, transplanting, watering, pest control – may have now become essential to secure sufficient food. And these may have created the first domesticated strains.

This appears to be what occurred at Abu Hureyra just before its abandonment. When Gordon Hillman studied the cereal grains from the site he found a few grains of rye from plants that had undergone the transition into domestic forms. When dated, they were shown to lie between 11,000 and 10,500 BC – the oldest domesticated cereal grain from anywhere in the world. Along with these grains, Hillman found seeds from the weeds that typically grow in cultivated soil. And so it appears that, as the availability of wild plant foods declined due to the onset of the Younger Dryas, the Abu Hureyra people invested an ever greater amount of time and effort in caring for the wild rye, and by doing so unintentionally transformed it into a domestic crop.\textsuperscript{15} But even this could not support the village – it was abandoned as people were forced to return to a mobile lifestyle, perhaps carrying pouches of cereal grain. The domesticated rye of Abu Hureyra reverted to its wild state.

With their increased interest in plant cultivation, the Late Natufians drifted away from the depleted woodlands where their forebears once flourished. They were drawn to the alluvial soils of the valleys, not only those of the River Jordan, but also those found by the great rivers of the Mesopotamian plain, and in the vicinity of lakes and rivers throughout the Near East. Large expanses of these rich, fertile soils became available as the rivers and lakes shrunk in size during the Younger Dryas. Wild, but cultivated, cereals grew well in such soil, especially when close to the meagre springs, ponds and streams that survived in the arid conditions.

The few rye grains from Abu Hureya are the only existing evidence that such cultivation in the Late Natufian created a domesticated type of cereal –
one that 'waited for the harvester'. It is possible that wheat, barley, pulses and flax were similarly transformed by the planting and harvesting techniques employed during the arid Younger Dryas. The plain fact is that at present we simply do not know exactly when or where the very first domestic strains appeared, or whether these evolved just once for each species, or whether they evolved independently or as a package. A pioneering study in 1997 compared the genetics of wild wheat from surviving stands in the Fertile Crescent with those of modern domesticated wheat and claimed that the hills of southeast Turkey, known as the Karacadağ, is the likely location of domestication – approximately 200 kilometres north of Abu Hureyra16 – although this needs further verification. We shall shortly see that a remarkable archaeological site is found in the vicinity of those hills.

It may have taken another thousand years or more for domestic wheat, barley and pulses to appear – possibly this did not happen until new villages and even towns had been established. But my guess is that somewhere in the Fertile Crescent, at some time during the Younger Dryas, one or more bands of mobile hunter-gatherer-cultivators had begun to carry new types of seed around. They may have noticed how much better their yields had become but they were surely quite unaware that those seeds were cultural dynamite. And their short fuse began to burn when the Younger Dryas came to its dramatic end.

At 9600 BC global temperatures rose by 7°C in less than a decade. It was a phenomenal helter-skelter change in climate. There is a sudden upsurge in the quantity of tree pollen in the sediments of the Hula core, although woodland never returned to the density and lushness that had been enjoyed by the Early Natufian people of 12,500 BC.

The impact upon the Late Natufian people was felt within a generation. Localities that had been able to sustain no more than a seasonal campsite, offered the possibility of a permanent home. Once again wild plant foods were abundant, closely followed by burgeoning animal populations. Streams and rivers flowed with renewed vigour; lakes reclaimed the soils they had for so long abandoned. Wild cereals benefited from increased CO$_2$ in the atmosphere.

The tricks of cultivation, those that had provided no more than meagre supplements to the diet of wild foods during the drought-ridden Younger Dryas, now produced abundant quantities of grain, peas and lentils. So the opportunity arose for the Early Natufian experiment in village life to be undertaken once again – an experiment perhaps remembered by the stories passed from generation to generation, an almost mythical way of life that could again become a reality. The opportunity was grasped – and this time there really was no turning back.

For the Early Natufians the key to village life had been the gazelle, the produce from the oak, almond and pistachio, and the wealth of plant foods
gathered from the woodland undergrowth and the forest steppe. When salvation from the Younger Dryas arrived at 9600 BC a quite different environment was the key: it was on the alluvial valley soils that the new phase of human history began. Archaeologists call it the Neolithic – the New Stone Age.