Plants and People in Ancient Anatolia

By Mark Nesbitt

Plant products have always played a vital role in the Near East: most importantly as food, but also as fuel, building materials, medicines, and for a host of other uses. In the past, the cultivation of crop plants was the major occupation of most of the population, which literally lived or died by its success in food production. Given the status of crop production as the major economic activity in pre-industrial societies, clearly it must form a central part of any study of ancient civilizations. Equally importantly, study of plants in the past will illuminate the daily life of the villagers who formed the great bulk of the people.

Until the 1960s archaeologists showed little interest in such topics, in part reflecting the priorities of art history and text-based history in determining the objectives of excavations; in part reflecting practical difficulties in recovering and studying plant and animal remains from archaeological deposits. Major changes in archaeological thinking occurred in the late 1960s—the “New Archaeology”—with two major consequences for archaeological practice. First, there was a shift to thinking about past societies as interlinked processes—“systems”—in which all the elements were important and in which individual sites or historical events could not be studied in isolation. Secondly, the basis of how we recover and interpret the archaeological record became a topic in its own right for questioning and discussion. Agriculture and diet were seen as integral to an understanding of the past, and there was a resulting keen interest in sampling methods for biological remains.

New techniques of flotation for collecting plant remains and dry-screening for bones were developed and as an ideal, if not in practice, results were integrated with studies of soil, pollen, and landscape history. Archaeologists working on excavations in Turkey were at the forefront of these developments in archaeological science, and my purpose in this article is to survey what has been achieved after thirty years.

Archaeobotany in practice

The archaeobotanist’s work falls into three parts: in the field, in the laboratory, and at the computer. In the field, the initial tasks are to build a flotation machine and to supervise the collection of samples from the excavation trenches for flotation. Sampling strategy depends both on the nature of the excavated deposits, and the research questions posed for the site. When not engaged in flotation, the archaeobotanist will be found studying the local flora and talking to villagers about their crops and wild foods. Back in the laboratory, the time-consuming task of sorting the “flots” under a stereoscopic microscope begins. Each sample contains a mixture of different types of plant remains, including seeds and biological remains.

Archaeobotany in Turkey, Past and Present

The study of plant remains from archaeological sites is known as archaeobotany or, more often in North America, as palaeoethnobotany (the two words are synonyms). The materials studied cover a wide range: from wood, seeds, tubers, and other plant parts, to pollen and phytoliths. All these types of remains require a common approach: using techniques based in the biological sciences to identify and interpret plant remains, but addressing questions rooted firmly in an archaeological framework (Greig 1989; Hastorf and Popper 1988; Miller 1991; Nesbitt 1993a; in press a; van Zeist and Casparie 1984). Originally, archaeobotanical services were often provided by botanists to archaeologists, but today archaeobotanists are archaeologists just as much as trench supervisors or specialists in ceramics and are usually working in archaeology or anthropology departments.

The earliest reports on plant remains from Turkey (indeed, one of the earliest anywhere) were published in the 1880s by the Berlin botanist L. Wittmack (1880, 1890, 1896) on crop seeds from Heinrich Schliemann’s excavations at Troy and the Koertes’ work at Bozhoyuk. This pioneering effort did not result in any continuing interest, and few plant remains were collected until the 1950s, when the dynamic Danish archaeobotanist, Hans Helbaek, began working on Near Eastern sites. A stream of reports followed, on sites of every period, which established the framework on which all future work has been based. In Turkey, Helbaek worked with James Mellaart at Beycesultan, Catal Hüyük, and Hacilar (Helbaek 1961; 1964; 1970), and with the Braidwoods on the Amuq plain (Helbaek 1960). In the late 1960s, Willem van Zeist from the Netherlands and Gordon Hillman from England began working in Turkey (Hillman 1972; 1978; van Zeist 1979/80; van Zeist and Bakker-Heeres 1975; 1982; van Zeist and Buitenhuis 1983). Although interest in archaeobotany has been strong since the 1960s, a shortage of trained staff was a major factor in limiting the number of excavations at which large-scale sampling was carried out. Even today, as archaeobotany becomes better integrated into university courses in archaeology, fewer than twenty archaeobotanists work in the Near East as a whole.
The Raw Materials of Archaeobotany

Ash heap outside a current-day house near Lake Van, eastern Turkey. Such middens are often found outside excavated houses. Resulting from the accumulation of dumping ashes, bones, and broken pots over many years, these are a valuable archaeological resource. All photographs by Mark Nesbitt except as noted.

Plant remains fall into two classes. **Macroremains** are large enough to be visible to the naked eye and include seeds and wood remains. **Microremains** must be viewed with a microscope and include pollen and phytoliths. The two classes enter the archaeological record in quite different ways and are sampled and interpreted differently.

**Macroremains**

In truly arid areas, such as the Egyptian desert, plant remains will often survive intact in archaeological deposits. However, in most of the Near East, including Turkey, winters are wet, and any plant materials will soon be consumed by animals or fall victim to rot. To survive, botanical remains must be in a biologically inert form that is not susceptible to decay. Charring is one of the most important routes to preservation. Seeds, wood, or other plant parts that come into contact with fire will often burn to ash, but much will not burn completely and ends up charred—black, but retaining much of its original dimensions and appearance. Although largely composed of carbon, other organic material does survive within, and lipids and DNA have both been successfully extracted from charred seeds (Brown, Allaby and Brown 1994; Brown et al. 1993; Hillman et al. 1993; McLaren, Evans and Hillman 1991). Residues of food and other organic substances can also be charred, and chemical analysis shows promise for identifying these (Heron and Evershed 1993; Mills and White 1989).

Contact with fire can occur in two ways: when houses burn down (a relatively common event in prehistory), or through the everyday disposal of household refuse into hearths and ovens, and the eventual disposal of their cinders into middens and pits—the garbage cans of antiquity. Obviously, there is a big difference in the type of samples that will be preserved by each of these routes, and this in turn will affect sampling strategies. In burnt destruction levels the contents of pots, silos, and other stores will be burnt in situ often well preserved by an overburden of fallen roof material. These primary deposits will be easily found in excavation of the debris resulting from the fire, and sampling simply involves recording their location and bagging the seeds. Household refuse is more complicated. As every household had at least one fireplace, the center for all cooking and heating activities, very large amounts of plant remains became charred and were incorporated into the archaeological record. Although ovens and hearths usually do contain some ashes, they were often cleaned out and their contents deposited elsewhere—in pits, in alleyways, or on the edge of settlements. As middens accumulated, ashes and other refuse became mixed with soil and decayed mudbrick. When excavated, this type of deposit often gives the misleading impression of sterile earth which does not contain plant remains. Here, flotation is essential to release charred plant remains from the soil matrix. Prior to the development of flotation techniques in the 1960s, it was often thought that plant remains did not survive except in destruction levels.

A wide range of plant materials can be preserved by charring, including seeds, chaff, tubers, straw, and wood.

**Microremains**

Pollen grains are tiny spores that fertilize the female part of the flower and are often distributed by wind or insects. The outer coat or exine of pollen is resistant to decay in anaerobic conditions such as in lake beds and bogs. Difference in the appearance of pollen grains allows their identification, usually to family or genus level. By examining the changing proportions of different pollen grains in cores from lake beds, changes in vegetation through time can be identified. Pollen analysis is an important tool for looking at vegetation on a regional scale (Bar-Yosef and Kra 1993; Bintliff and van Zeist 1982; van Zeist and Bottema 1991). Pollen grains survive poorly in typical archaeological deposits in the Near East and are therefore not usually sampled from archaeological contexts (Bottema 1975).

Phytoliths are silica bodies that form within certain plant cells. After plants die and decay, phytoliths are deposited in archaeological soils, from which they can be extracted in the laboratory. Phytolith analysis is a young field, but first results suggest this will be a useful tool once identification techniques are further developed (Mulholland, Rapp and Gifford 1982; Rapp and Mulholland 1992; Rosen 1987; 1989; 1991). Possible uses of phytolith analysis include the identification of plants under-represented in charred plant remains and, in conjunction with studies of soil micromorphology, studying the detailed histories of archaeological deposits (Matthews and Postgate 1994).
The flotation revolution

Flotation works on a simple principle: soil particles sink, charred plant remains float. The idea of immersing archaeological soil in water and floating off the plant remains into a sieve was pioneered in the mid-1960s in North America and by Hans Helbaek (1969) at Ali Kosh in Iran. However this flotation was carried out on a small-scale with buckets, and had a limited impact on the quantity of plant remains recovered. In the late 1960s the flotation machine was devised, by which large quantities of soil—up to 1000 liters—can be processed each day. Originally a cumbersome device that required several operators (French 1971), a version of this based on a 40-gallon oil drum (ubiquitous in the Near East) is now widely used (Nesbitt n.d. b; Williams 1973).

Water is pumped through a valve halfway down the tank. Once the tank is full of water, soil from an archaeological deposit is poured gently into the tank. As the lumps of soil disaggregate, sit drops to the bottom of the tank and plant remains float to the top and are carried by the water flow through a spout and into 1 mm and 0.3 mm sieves. The float from each sample is wrapped in cloth and gently dried in the shade before bagging up for future study. A 1 millimeter plastic mesh (widely sold in Turkey as mosquito screen) lines the top half of the tank, and catches heavy items as they sink. This heavy residue will contain a range of bones and artifacts and offers an excellent check on their recovery from the site. At early or coastal sites the ability of the flotation machine to recover tiny bones from fish and wild animals and small artifacts such as microliths and beads is just as important as its role in collecting plant remains. The contents of the heavy residue are also a good indicator as to whether any of the plant remains are sinking—a particular problem with dense seeds such as nuts and pulses.

The large capacity of the flotation machine means that a wide range of deposits can be sampled without slowing down excavation. It is important that enough soil is processed from a deposit, as the density of plant remains is often low. Soil volumes for a sample might range from 50 liters at a typical Bronze or Iron Age settlement mound to 500 or 1000 liters at a Palaeolithic or Neolithic site, where seed densities are much lower. The key ability of the flotation machine is that it achieves a good yield of material from virtually all sites. Furthermore, it is cheap (about $200 for the machine) and flexible. If water is in short supply, a recycling tank can be used. If electricity is not available, a petrol pump can be used. Any blacksmith can build a flotation machine, and they are long-lasting.

Interpretation of plant remains from a burnt destruction level is relatively straightforward. Such deposits often come from crops cleaned for storage: for example, a silo of wheat grains or a jar of lentils (Jones et al. 1986). Interpretation hinges on accurate recording of each deposit, sometimes a tricky procedure in the tangle of ashes and collapsed roofs typical of a burnt level. For example, a single room burnt at Sardis by invading Persians in the mid-sixth century BCE was found to contain seven deposits of barley, two of bread wheat, one of chickpeas, and one of lentils. In some cases the seeds were found in their original jar, but most were probably stored in sacks which have not survived burning, leaving heaps of seeds on the floor. A group of garlic cloves was found at the base of a wall; it may have fallen from a hanging shelf. Overall the finds suggest a diet in which barley was most important, and a relatively small number of crops formed the staple foods. However such a deposit is only a snapshot of what was found in one room on one day.

In contrast, flotation samples from hearths, middens, pits, and other such contexts offer a much broader picture...
Ethnoarchaeology

How do we bridge the gap between identifying seed assemblages from archaeological samples and deciding what these mean in terms of human behavior? Archaeobotanists are fortunate in being able to visit villages where traditional farming is still practiced, and where we can directly observe agricultural activities and their resulting effects on the material world. It is the focus on material culture that separates ethnoarchaeology from social anthropology: we cannot interview our prehistoric subjects, and we must therefore enable their material remains to speak for them (Jones 1983).

In the early 1970s Gordon Hillman spent four excavation seasons at the village of Ayvan in southeast Turkey, destined to be submerged by the Kebar dam in 1974. By observing farming activities, collecting samples of crops during processing, and talking to villagers, he was able to show that the composition of seed assemblages was diagnostic of the processing that farmers had undertaken (Hillman 1973; 1981; 1984a; 1984b; 1985). These processes are complex, ranging from husbandry activities such as irrigation and weeding, to the sequence of crop processing by which the plants growing in the field are harvested and prepared for cooking. The crop-processing sequence for cereals such as wheat and barley is a multi-phase process, involving threshing to break up the ears, winnowing, and a series of sievings. Each of these steps generates a distinctive waste by-product assemblage as well as the main crop component destined to pass to the next phase of processing.

A failure to appreciate the effects of crop-processing can lead to major misinterpretations. A simple example is the presence of weed seeds in a sample. Processing of a single sheaf of wheat would result in a final end-product—clean wheat grains—but also by-products composed of light weed seeds and chaff from winnowing; large, heavy weed seeds and chaff from sieving with a large mesh; and small weed seeds and chaff from fine sieving. It would be a mistake to interpret the lack of weed seeds in the end-product as meaning the original crop had no weed infestation, while it would also be wrong to regard the mixture of weed seeds and chaff in a sieving by-product to be typical of ancient diet.

Archaeobotanists are using the ethnoarchaeological results from Hillman's work and that of later projects in Greece and elsewhere, combined with statistical techniques, to establish the nature of each of their samples before tackling wider questions of interpretation. Ethnoarchaeology has been used to look at other aspects of daily life such as the use of stone grinding tools and the functions of different types of ovens. Decision-making in traditional agriculture is another important line of enquiry.

Current day farmers are a valuable source of information. These villagers in the Pontic mountains have excellent recall of agricultural practices from the days before tractors and chemical fertilizers.

Bulgur-making in progress. A seten is used to remove the bran from boiled wheat grains. The pressure of the vertical millstone on moistened grain causes the bran to slide off. We still know all too little about food preparation in antiquity. As food rarely enters the archaeological record, we must rely on interpreting food-related artifacts. with implications for how we interpret changes in agricultural practices in the archaeological record. Wild plants are still an appreciated food supplement, and their use can give insights into the diet of pre-agrarian hunter-gatherers, as well as farmers' use of gathered plants as supplemental foods.

Rural life is changing fast in the Near East, and there is an urgent need for more ethnoarchaeological work while traditional crops and techniques are still in use.
of plant use. This is because the ashes in these deposits usually accumulated from a number of activities. Sardis is a good example of how flotation samples from redeposited seed assemblages can give different but complementary results to seeds from burnt levels. Flotation of a series of unburnt floor levels adjacent to the burnt level showed that barley was present in all the samples, while bread wheat was present in sixty percent of samples. Compared to the burnt level, these results confirm the importance of barley but suggest bread wheat was under-represented in the burnt room. A further five crops were found in the flotation samples that were absent from the burnt level: millet, grass pea, bitter vetch, grape, almond, and flax. Additionally, weed seeds and chaff were present—highly informative classes of plant remains totally lacking from the cleaned storage samples. It is significant that garlic was not found in the flotation samples—herbs and spices rarely enter the archaeological record because they are used in small, carefully husbanded quantities. Such plant products most often found in burnt levels and other exceptional contexts, such as shipwrecks (Haldane 1990; 1991; 1993).

Unlike a potsherd or coin, plant remains carry no obvious indication of their age and must be dated using evidence from careful stratigraphic excavation. The recent development of Accelerator Radiocarbon—Dating has allowed individual seeds weighing a hundredth of a gram to be radiocarbon dated—a valuable check, especially with contentious early material (Harris 1986).

The origins of agriculture

One of the great successes of archaeobotany has been unravelling the early history of farming. The development of agriculture is a critical turning point in the development of human society (Harlan 1995; Harris and Hillman 1989). After the origin of agriculture, there is a rapid increase in population and spread of farming villages, and later on agriculture underpins the development of the first literate civilizations in the early cities of Mesopotamia. Yet, until recently, there was little hard evidence which could be used to explain this remarkable human invention. Plant remains or bones had hardly been collected from pre-agrarian or early agricultural sites.

Interdisciplinary, integrated research projects have been essential in understanding the dynamics of early agriculture and the preceding hunter-gatherer cultures. Botanists have demonstrated that the wild ancestors of crop plants such as wheat, barley, lentils, and chickpeas grow only in the Near East, showing that they must have been taken into domestication in this region (Zohary and Hopf 1993). Excavators, using radiocarbon dating, have shown that the earliest Neolithic villages—settlements based on farming—occur in the Near East, at about 10,000 years ago. As one moves away from the Near East, the earliest farming settlements are later in date—consistent with the spread of farming from its central area of origin. Archaeobotanists have shown that Near Eastern sites dating more recently than 10,000 years ago have domesticated crops, while earlier sites only have remains of gathered, wild plants (Miller 1992; van Zeist 1980).
In outline the picture is reasonably clear. In the upper Palaeolithic humans gathered the wild plants and hunted the wild animals of their environment. At a site in oak forest, such as Hallan Çemi on a tributary of the Tigris in southeast Turkey, the diet included wild almonds and Pistacia nuts, wild pulses, and the seeds of riverside plants such as club-rushes (Scirpus maritimus) and knotweed (Polygonum). A thick layer of charred fruits of a tumbleweed (Gundelia tournefortii) was also found, perhaps the remains of an unsuccessful attempt at extracting the oily fatty seeds (Rosenberg and Davis 1992; Rosenberg, Nesbitt, and Redding in press). At sites such as Abu Hureyra and M’lefaat farther to the south, in the steppe woodland of northern Syria and Iraq, fewer forest plants were used (Hillman, Colledge, and Harris 1989). Large quantities of wild cereals, wild pulses, and terebinth nuts (Pistacia) were collected, as well as an extremely diverse range of other plants—at Abu Hureyra from about 130 different species. Some of these hunter-gatherer villages contained well-built houses and were probably occupied year round.

About 10,000 years ago, somewhere within the “fertile crescent” that is so rich in these wild ancestors of crops, foragers began to collect and sow the seeds of wild plants they had previously simply gathered. During harvesting the first farmers unconsciously imposed selection pressures on wild plants that led to domestication. Most importantly, crops lost their ability to disperse their seed without human intervention. Cereal ears, for example, remained intact at maturity rather than shattering and scattering the seeds. The advantage of such changes to farmers is obvious—seeds stay on the ear during harvesting, rather than falling to the ground (Hillman and Davies 1990; 1992).

It is still unclear exactly where in the Near East the first steps to agriculture were taken. Some of the wild ancestors of the “founder package” of crops that appears at most Neolithic sites grow all over the hilly flanks of the “fertile crescent”; some are more restricted. Wild barley, lentils, and peas are widespread all over the fertile crescent. Wild emmer wheat grows widely but is much more abundant in the Levant; wild einkorn wheat mainly grows in southern Turkey and adjacent areas; chickpea is restricted to a narrow region of southeast Turkey. Most likely, we will never know exactly where or over how wide an area of the Near East agriculture originated, as farming techniques probably spread very quickly, and crops would have been domesticated in different areas, quickly merging to form a founder “package” of Neolithic crops. It is also likely that the distribution of wild ancestors has changed with time. However, in view of the evidence for early settlement and its wealth of wild ancestors of crop plants, it is likely that Turkey played a crucial role in the origins of agriculture.

Why hunter-gatherers began farming is a topic of hot debate. In the 2000 years before farming began, global environmental changes occurred as the ice age came to an end. Pollen diagrams show that a wetter and warmer climate in the Near East led to the spread of forest into the steppic interior of Anatolia and other large land masses (van Zeist and Bottema 1991). It seems likely that these changes caused instability in existing hunter-gatherer life, perhaps leading to increased population, and that increased demand for food led to the first experiments in agriculture. A major barrier to a better understanding of this period is the paucity of known early sites. These are often low mounds that are difficult to locate by archaeological surveys. At present only two such sites from the period immediately preceding the Neolithic have been excavated in the interior of Anatolia: Pinarbaşı and Hallan Çemi. The situation is similar for the earliest Neolithic: a few more sites are known, but plant remains have been published from only one early farming village, Çayönü, dating between 7500–6000 BCE (van Zeist and de Roller 1991/1992). Further advances in studying agricultural origins will hinge on finding more early sites and on ensuring that
excavators undertake the full recovery of plant and animal remains.

**Changing crops, changing cultures**

How should we interpret the waning and waxing fortunes of different crop species? Even on the broad scale of Turkey as a whole, major changes through time are apparent (Hubbard 1980). Are these simply chance variations, or can we relate these changes to wider economic patterns? Observation of farmers’ decision making, whether in a Near Eastern village or on the North American prairies, shows that decisions on what is grown and how it is grown are directly linked to market forces—whether these are responses to consumers, or imposed by central government. Choice of crops is not a matter of chance, and it would not have been in the past. But how can we apply this insight to archaeological plant remains?

Einkorn wheat and emmer wheat make a good case study. These archaic cereals are distinct from most other wheats in having seeds enclosed by a tough husk, the glumes (Charles 1984; Harlan 1967; Samuel 1989; 1993). This characteristic means that vigorous pounding is required to release the seeds, but it also protects them from pest damage while in storage. Emmer and einkorn were among the Neolithic founder species, appearing at the earliest farming sites, and spreading west as far as the British Isles and east to India and beyond. Today these wheats are on the verge of extinction, their cultivation restricted to remote mountainous areas scattered across Europe, southwest Asia, India, and Ethiopia. Archaeobotanical evidence from Turkish sites shows that up to about 3000 BCE they are grown alongside other cereals such as macaroni and bread wheats and barley. However, at the beginning of the Early Bronze Age, about 3000 BCE, both emmer and einkorn wheat abruptly disappear from the archaeological record in southeast Turkey, never to reappear again.

**Wild pea.** A wide range of wild pulses are found at pre-agrarian sites, only a few of which were domesticated. The beginning of agriculture saw a narrowing of the food base from a hundred or more wild species to less than ten crops. Photo courtesy of Ann Butler.

( van Zeist and Bakker-Heeres 1975; author’s unpublished data from Asalan)

**Why did this happen?**

Fortunately emmer and einkorn still grow in a few villages in the lush Pontic mountains of northern Turkey. I was able to travel to the Pontic mountains with Dr. Delwen Samuel, a specialist in the history and use of emmer wheat from Cambridge University, and to talk to farmers with first-hand knowledge of these archaic crops. We found that emmer and einkorn are still grown because they are uniquely resistant to fungal diseases such as stem rust that flourish in the wet, warm summers of the Pontic mountains. Emmer and einkorn are also prized because of their high quality as chicken feed and, for human food, as bulgur, a popular cracked wheat food. However today their area of cultivation is in steep decline, often restricted to one field in a village.

Are there any parallels between this steep decline now and that of the Early Bronze Age? Farmers told us that there were two main reasons why cultivation of bread wheat was increasing at the expense of emmer and einkorn. Firstly, government subsidized fertilizers were available and bread wheat responded better to these. Secondly, grain merchants would buy bread wheat, but were not interested in minority crops such as emmer and einkorn. Thus, even though bread wheat is susceptible to disease and fared poorly in their fields, it was better integrated into the modern cash economy.

Returning to the Early Bronze Age, in southeast Turkey this period is characterized by a large increase in settlement density and a shift from a landscape of small villages to a more hierarchical system with villages centered on large towns (Whallon 1979). A plausible hypothesis is that increasing demand from a larger, more urban population encouraged farmers to shift production to crops that responded better to increased manuring and which were easier to process once harvested, such as bread wheat and macaroni wheat. Ways of testing this idea are currently being explored, including experimental cultivation of different wheats under different manuring conditions, analysis of weed seeds as indicators of changed husbandry practices, and a search for parallel evidence of intensification in animal husbandry.

Similar large scale changes in settlement patterns and economies over the Near East as a whole may account for the sudden appearance of fruits such as grape and fig as perennial crops at the beginning of the Early Bronze Age (Rivera Nunez and Walker 1989; Runnels and Hansen 1989).
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<tr>
<th>CEREALS</th>
<th>BOTANICAL NAMES</th>
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<tr>
<td>Einkorn wheat</td>
<td><em>Triticum monococcum</em></td>
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<td>Bread wheat</td>
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<td>Naked barley</td>
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Timechart of major crops in Turkey. Thick lines indicate periods of widespread cultivation; thin lines represent cultivation limited to small areas. Question marks indicate likely periods of introduction. It is likely that cultivation of some crops began in the Classical or Byzantine periods, but this cannot be documented owing to lack of archaeobotanical data for these periods.

1986; Stager 1985). For later periods, the sporadic recovery of archaeobotanical material means that patterns are less clear cut. However we have enough data to hint at major changes in agrarian practice: the introduction of summer season crops such as millets in the Iron Age (Nesbitt and Summers 1988); the possible arrival of fruits from further east such as cherry and peach in the classical period; the still unresolved question of whether such major crops as cotton, rice, and opium poppy were cultivated in Anatolia prior to the Islamic period (Canard 1959; Faroqhi 1979; Watson 1983), and the post-Columbian diffusion of Mesoamerican crops (Andrews 1993). Linking changes in crop species and crop husbandry techniques to the major long-term changes in settlement patterns that can be identified by detailed archaeological surveys (e.g. Whallon 1979; Wilkinson 1988) is a major opportunity and challenge for archaeobotany.

The great range of topography in Anatolia makes for wide diversity in farming systems, ranging from the classic Mediterranean olive and vine cultivation of the coast, to the wheat and barley fields growing high on the Anatolian plateau (Erinç and Tunçdilek 1952). Much of our archaeobotanical evidence comes from central...
and eastern Turkey because that is where most prehistoric excavations have been carried out. As we learn more about ancient farming in western Turkey, with its Aegean contacts, and in regions at lower altitudes, the more diversity in ancient agriculture we can expect to find.

Similar changes have occurred in dietary preferences. Barley is overall the most common cereal in archaeobotanical deposits from Turkey. Today, we think of barley as an animal feed or for malt (Sams 1977), but there is good archaeological evidence for its role as human food. At Sardis and Gordion, pots of barley husks were found amongst the ashes of catastrophically burnt rooms dating to the mid-first millennium BCE. These are the by-product of making pearl barley by stripping off the grain's silicaceous, inedible husks. This tedious dehusking is not necessary for animal feed and must represent preparation of barley for human food. Allied with evidence from classical texts for the importance of barley as a human food, it is likely that ancient barley remains represent human food just as much as ancient wheat.

Barley is sporadically noted as a food in Turkey in the present, but it is unclear when it ceased to be an important food for humans. The pulse group offers two further cases: bitter vetch and grass pea. Both are widely grown today in Turkey as fodder crops and, as their seeds contain toxins, they are not obvious human foods. Nonetheless, both are abundant in archaeobotanical samples from the Neolithic period onwards and have been found in kitchen contexts. It is highly likely that both were used for food. Provided they are adequately cooked and eaten as part of a mixed diet, both make good foodstuffs (van Zeist 1988). Clearly we must be careful not to project modern ideas of foodstuffs into the past in an uncritical manner.

Fuel

Fuel is an essential commodity for cooking and for heat during the long winter of the Anatolian plateau. Given the role of fire in preserving plant remains, it is not surprising that fuel remains make up a large part of most archaeobotanical samples. A wide range of plant products is still used as fuel in villages today. Where wood is available it is, naturally, the favored fuel (Horne 1982). Strict laws protect Turkey’s forests, but brushwood can still be collected, and large areas of eastern Turkey are covered by enerji orman.
Piles of dung cakes, on the shores of Lake Van in eastern Turkey. These large stacks are an essential store of fuel for the winter. Archaeobotanical samples from excavation near the village show that dung was in use here in the Early Bronze Age—an indicator of deforestation.

(“energy forest”), woodland of oaks coppiced for fuel. Small bushes and other woody plants, such as the tragacanth (Astragalus) in the Taurus mountains, are also collected.

However, in large areas of Turkey cutting and grazing have led to extensive deforestation, particularly in areas such as the central Anatolian plateau, where climatic conditions are rigorous (McNeill 1992; Wilcox 1974; 1992). In these areas animal dung (Turkish: tezek) is an important source of fuel. Dung of domestic animals is collected from stables and fields and buried in pits for several months. Over this time the dung becomes dry and odorless. When it is dug up, it is mixed with water and straw and molded into cakes that can be stacked up for use through the winter months. Dung cakes burn well and cleanly and are a favored fuel. Today, the use of dung as fuel correlates closely with lack of woodland, and the presence of dung in archaeobotanical samples is therefore a useful indicator of ancient deforestation (Miller 1984; 1985; 1990; Miller and Smart 1984). Identification of dung in ancient samples is also important because seeds of grazed plants pass through the animal, end up in the dung and enter the archaeological record as charred seeds. This can contribute a significant number of seeds to archaeobotanical samples and results in a very different seed assemblage from that which is derived from crops and crop-cleaning.

Archaeology and texts: the case of Hittite ZIZ

There is a tendency for archaeologists working in historical periods, for which texts survive, to assume that the written sources already contain all the information they need. This has led to a real neglect of archaeobotanical or zooarchaeological recovery from sites in the Late Bronze Age onwards. Unfortunately, not only do the documents rarely contain the type of information we need for understanding the dynamics of farming economies, but translation of terms for crops is highly problematic.

For example, in the Hittite period many tens of thousands of tablets have been excavated at Boğazköy, the Hittite capital. Almost all of these deal with diplomacy, law, religion, or myth. Even if we had perfect understanding of these texts, they would offer us virtually no quantitative information on Hittite agriculture. In any case, translation of the Hittite crop terms has proved almost impossible. Philologists have, however, assumed that Sumerian words used as shorthand by Hittite scribes bore the same meaning as in Mesopotamia.

One of the most frequently used term for a crop is ZIZ, generally translated as emmer wheat in its original Mesopotamian context and assumed to mean the same in the Hittite texts (Gurney 1990; MacQueen 1986). Some years ago Hoffner (1974: 68–69) suggested that archaeobotanical data for the decline of emmer...
wheat before the Late Bronze Age meant that ZIZ must either refer to bread wheat or be a general term for wheat. Recent archaeobotanical analysis of samples from Kaman Kalehöyük, a Hittite town, confirms that emmer is present only in tiny amounts. Bread wheat is by far the most common wheat, supporting Hoffner's identification (Nesbitt 1993b).

While the Hittite texts do contain some interesting data on crop plants and agricultural techniques, they are best used in combination with archaeobotanical data. Exactly the same point applies to the Classical and Medieval periods (Humphreys 1991:284–308; Sallares 1991; Watson 1983). It is certain that new crops entered Turkey and major agricultural changes occurred, yet these are poorly documented in the historical texts. Only with the inception of the Turkish Republic in 1924 can documentary sources and ethnography be said to replace archaeobotanical data.

Conclusions

Archaeobotanical research in Turkey and the rest of the Near East is at an early stage. The small but ever increasing number of scholars in the field is still working on basic techniques of seed identification and questions of interpretation; few major assemblages of seeds have been recovered and even fewer published. Large-scale recovery programs for plant and animal remains are taking place at a mere seven or eight of the dozens of current excavations in Turkey.

The early stages in the development of a discipline are an exciting time; every fresh bag of plant remains from an excavation is likely to hold important new finds. I have tried to show how archaeobotany can illuminate every period of the human past; whether in prehistory, at the dawn of agriculture, or during the literate civilizations since the development of writing. Successful archaeobotanical analyses depend on a wide range of techniques: making decisions about sampling in the field; understanding the modern flora; identifying seeds under the microscope; and carrying out ethnographic work with current day farmers. Most of all, the future of archaeobotany hinges on the use of its ability to address major archaeological questions, as one of a range of techniques on a modern, integrated project.

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