Chapter 17

PLANTS OF THE ROMAN GARDEN

Wilhelmina F. Jashemski, Kathryn L. Gleason, and Michael Herchenbach

WHEN WE THINK of gardens, we immediately think of the plants that grew in them. Because of the tragic way in which the Vesuvian sites were preserved, they contain an abundance of evidence regarding the plants that grew there in antiquity (Figure 17.1). Outside of the Vesuvian region, the remains of the actual plants of a garden are rare to find, even when other evidence for a garden has been discovered. However, archaeologists and archaeobotanists are now systematically collecting plant remains from garden fertilizer, wells, kitchens, hearths, ditches, refuse pits and fills, latrines, and cesspits on sites throughout the ancient empire. As Wilhelmina Jashemski first prepared this chapter with colleagues in botany, they saw the extent to which an increasing variety of plants became available in many regions of the Roman Empire during the first centuries AD.[1] New studies are beginning to chart the trade routes, as well as to document local efforts – whether successful or not – to adapt imported plants to new locales. In tandem with texts and representations in art, a picture is slowly developing of the dynamic trade and distribution systems of plants throughout the Roman Empire, revealing the ways they were distributed to markets and nurseries and then on to gardens, orchards, and fields, and ultimately to integration into the culture of the inhabitants.

Despite these advances, we cannot, in most instances, determine the species of plants in a specific garden from the archaeobotanical

Figure 17.1 The reconstructed garden of House 11.i at Herculaneum.

remains, although planting pots, pits, and root cavities can often tell us their locations. Wilhelmina Jashemski was fortunate in working in the Vesuvian region, where the circumstances of the eruption preserved plant remains in exceptional ways. However, despite her careful integration of archaeobotanical finds with textual and artistic evidence, she expressed disappointment that robust archaeological remains of garden plants could not be found even in that region. Her interpretations of garden plantings were based upon the educated, but not scientific, opinion of Dr. Fideghelli, who examined the root cavities in the Vesuvian gardens and helped her narrow the range of possibilities: upon evidence from pollen or carbonized remains: and upon a consideration of plants mentioned in texts or represented in art that might be appropriate to the particular garden.

Since her death, there have been advances in archaeobotany. We have more scientific techniques than were available to her, but still not enough to reliably identify the plants in a garden. She would have been delighted to learn that pollen extracted from plaster on garden features (walls, pools, columns, etc.) is more reliably preserving pollen from ancient gardens than she found to be the case with soil samples.[2] This evidence, in turn, can assist in determining if carbonized plant remains, commonly recovered from garden soils, are from garden plants, from fertilizer, or other sources. Environmental studies, such as soils analysis, or the recovery and analysis of mollusk or insect remains, are now used to indicate other aspects of a garden's environment: acid or basic soils, sunny or shady areas, high or low vegetation, sparse or dense foliage. To this scientific information, we may evaluate the social, economic, and religious uses of Roman plants gained from archaeological evidence in tandem with texts in order to further assess garden plants and their cultural variety.[3]

This chapter outlines the types of evidence that can be used to understand

plants in Roman gardens and then moves on to review the state of archaeological research on Roman garden and orchard plants, their use, and dispersal in the Roman world.[4] The current state of the field is that a large corpus of Roman-era plants has recently been assembled by archaeobotanists, some of which may indicate plants grown in local gardens or orchards, as opposed to field crops or being imported as foodstuffs. To demonstrate local cultivation, a range of evidence – plant micro- and macro-remains – must be studied and compared. Relatively few garden sites have been studied archaeobotanically, but this larger contextual picture will be essential to interpreting the remains when specific gardens are examined. Knowledge of plants in literature and art will also be advanced.

The original manuscript of this chapter by Wilhelmina Jashemski included an illustrated catalog, arranged by the types of plants used in different garden contexts, now available to readers electronically in Volume 2. It begins with examples of large trees valued for their shade and/or characteristic form in gardens, followed by ornamental and fruit trees popular in both orchards and *viridiaria*. Flowering shrubs, vines, and plants used in hedges follows. Finally she lists cultivated and wild flowers, aromatic plants, and garden vegetables and herbs. The catalog complements Jashemski's other publications and offers an overview of some of the most significant or interesting species associated with ancient gardens, abundantly illustrated with ancient representations, archaeological specimens, and modern plants, with many previous unpublished images by Stanley Jashemski. We have updated it with new information, as she would have wished.

TYPES OF EVIDENCE FOR PLANTS IN THE ROMAN EMPIRE

Plants in Ancient Texts, Inscriptions, and Graffiti

Ancient texts have long provided the foundation of knowledge about ancient plants but the evidence is not without its problems. The literary references vary from scattered mentions of plants in poetry and prose to the more detailed descriptions in the works of the agricultural writers Cato (d. 149 BC), Varro (d. 27 BC), and Columella (d. ca. AD 70), and Pliny (d. AD 79). Many are discussed above, particularly in Chapters 9 and 10. Some plant names have endured since antiquity and the texts allow us to be fairly certain they pertain to the same genus known today, such as the crocus (Greek κρόκος, Latin *crocus*), the cyclamen (Greek κυκλάμινος, Latin *cyclaminus*), and the chicory (Greek κιχόριον, Latin *cichorium*). In other cases, it is not possible to know what plant an ancient author is referring to when he mentions only the name of the plant but does not describe it. Identification is particularly difficult when the Romans gave the same name to different plants, as in the case of the *viola*.[5] Also, at times, the same plant is referred to by several different names, perhaps the result of regional nomenclature.[6] With the advent of archaeobotany, literary references no longer form the sole basis for plant identification and use in the classical world.

Our knowledge of Roman plants relies most heavily on Pliny's *Natural History*. This encyclopedic work consists of thirty-seven books, which cover, as the author says, "the world of nature."[7] By far the largest part of the *Natural History*, Books 12–27, is devoted to plants and their various uses, including medicinal. Pliny's method was to bring together, for the first time, the scattered material from many authors. Fortunately, he is meticulous in citing his sources (more than one hundred). Most important, Pliny studied the actual plants. He tells us that "he enjoyed the good fortune to examine all but a very few plants" in the garden of Antonius Castor, the greatest authority of his time, who grew many specimens in his special garden.[8] It is in his chapters on botany that Pliny comes closest to making a genuine contribution to science, providing us with important information regarding the introduction of new horticultural and agricultural species into Italy.

Pliny nowhere mentions, however, his contemporary, the great herbalist Dioscorides of Anazarbos, a skilled Greek physician from Asia Minor. The herbal of Dioscorides describes more than five hundred plants and their medicinal uses, and it became the standard work for centuries in both the East and the West. Written in Greek, it is better known by its Latin title, *De materia medica* (The Materials of Medicine). Dioscorides points out that he knew plants from studying them in the field and not merely from books. But he studied carefully and used extensively the works of those who came before him. Later annotations to Dioscorides inform us about synonyms of the Greek plant names in other languages – Armenian, Dacian, Egyptian, Ethiopian, Gaulish, Spanish, and of course Roman plant names. Unfortunately, our knowledge about the time frame when those names were added and the source from which they were taken remains uncertain.[9]

Another valuable source of information is the fourth-century Palladius, a knowledgeable agricultural writer, who owned estates in Italy and Sardinia.[10] His *Opus agriculturae* (The Work of Farming) is a month-by-month practical manual, which includes instructions on the vegetables, herbs, etc. to be planted each month. Palladius relied on earlier authors such as Columella, Gargilius Martialis, a third-century writer, and others but it is also clear that he had personal, practical experience.[11] He was aware of climatic conditions and variations in soils, pointing out that the gardener should take into consideration his location and the local weather. For example, in a cold spot autumn sowing should be earlier, the spring one later; in a hot one, autumn sowing can be later, the spring one earlier.[12]

Outside Italy, we have no preserved Roman-era agricultural manuals. Fortunately, Columella, originally from Hispania Baetica, and Pliny the Elder frequently mention varieties of plants that grew well or originated in the provinces. They, as well as other agricultural writers, cite older foreign sources, above all, Mago the Carthaginian, the "father of husbandry," whose twenty-eight books on agriculture most likely date back to the end of the third or beginning of the second centuries BC.[13]

Clearly, many Greek and Hellenistic works contributed to the Roman knowledge on gardening and plants. According to Varro, for example, more than fifty

treatises in the Greek language, from Sicily to Asia Minor, were helpful for writing his own books on agriculture.[14] One of the most influential Greek writers on plant life of the pre-Roman era was the philosopher Theophrastus (d. 287/6 BC), the successor of Aristotle at the Lyceum, one of the famous philosophical schools of Athens. Theophrastus, now commonly regarded as as the father of botany, writes about plants, mainly of Greece, in his surviving important works *De historia plantarum* and *De causis plantarum*. He drew his expertise from the study of actual plants, most likely many in his own garden in Athens.[15]

The Hebrew and the Christian Bible both offer long-cherished sources of information on plant use. Immanuel Löw brought the ancient sources discussed above to bear on his seminal work of 1881 on plant names in the Jewish tradition, *Die Flora der Juden*, as well as *Aramaeische Pflanzennamen*.[16] Michael Zohary has provided an authoritative account of biblical plants in English, and the most recent works are by the botanists Nigel Hepper and Lytton John Musselman.[17] Plants and gardens are also frequently mentioned in the rabbinical sources. Sandra Shimoff offers an overview with discussion of specific plants, such as the sycamore, vine, and the rose.[18]

Graffiti and inscriptions also furnish useful information. The Pompeians, for example, often scribbled on the walls of houses, shops, or villas lists of items bought or sold, crops raised, or other information that sometimes mention plants.[19] Palm branches and other representations of plants are seen in graffiti of the second and third centuries AD at Ostia.[20] Some inscriptions from Delos reference many plants that were grown there, such as grapevines, palm, laurel, and olive, as do inscriptions from Dura Europus in Syria.[21]

Throughout the empire, labels on *amphorae* and other containers record the names of plants or plant products that had been stored in them. A collection found in the storerooms at Masada, for instance, tells us of apples from Cumae, Valerian wine, and provides other links between the stores and their origins.[22] Other *dipinti* provide important evidence of the trade of Roman agricultural products to the northwestern provinces. Beyond the relatively well-documented trade of wine, olive oil, and garum around the Mediterranean, Ulrike Ehmig has also found interesting evidence for the trade of Syrian figs and possibly pears from North Africa to the ancient Augusta Vindelicum (modern Augsburg).[23] An *amphora* from Cologne has a clear notation of OLI (olives) and a later one DULCIS, which could mean sweet olives, or perhaps simply a different content (Figure 17.2).[24] Such evidence adds to our understanding of the dynamics of the trade of plant and plant products around the Mediterranean and beyond, providing context for an eventual study of trade in horticultural plants.

The evidence from papyri for plants is discussed by Roger Bagnall in his introduction to Egyptus in Volume 2 of this book. To this we may add several references to plants in the Dead Sea Scrolls, which range from items of symbolic[25] and pharmaceutical[26] value to agricultural purposes.[27]

Plants in Ancient Art

Representations of plants in Roman art are abundant, but they vary greatly in

Figure 17.2 *Amphora* from Cologne used for olive transport.

the extent to which they can be identified throughout the empire. In general, the portrayal of plants and gardens during the Augustan era is highly realistic and finely detailed, allowing identification to genus and sometimes to species. The interest in careful representation of plants continued through the Julio-Claudian and Flavian eras, and representations that are less finely rendered can sometimes be compared with finer examples. In later Roman art, plants receive a more stylized treatment, allowing confident identification of only the more iconic examples. At present, evidence from art allows us to sketch a general sense of a garden culture in a particular area but not to evaluate the extent of that culture. The area buried by the eruption of Mt. Vesuvius, where artistic representations and garden remains are in such close proximity that comparisons can be made, offers a model for other areas with more fragmentary remains as garden archaeology reveals more remains of actual gardens.

PAINTINGS

The many examples of plants portrayed in wall paintings constitute a unique and precious source of information.[28] Plants and plant motifs not only decorated garden walls, they are found throughout properties. A garden painting often extended the limited space of a room or courtyard and could portray plants too large to grow in the actual garden, as discussed in Chapter 11. Although these garden scenes are fanciful, with their fruits and flowers all on display regardless of season, many plants are rendered in sufficient detail that we can identify them with certainty and begin to study their role in garden culture. Of these, the garden scenes from the Villa of Livia at Prima Porta are the most closely studied, but later paintings throughout the Vesuvian region are also represented in great detail. However, all garden paintings must be used critically, as the artist was at liberty, for example, to stylize or combine features of different plants, or in other ways to take creative license with the depiction of plants (Figure 17.3).[29]

Figure 17.3 Silver poplar identified in stylized representation of plants in a garden painting at Oplontis.

Garden paintings are found in similar contexts throughout the empire from the first to third centuries AD. The villa at Fishbourne featured a low wall with painted foliage and a trellis fence to extend the effect of the garden's plantings along the foundations of the courtyard.[30] During the next century, similar paintings provided illusionistic gardens and garlands for the residents of large urban apartments in the Hanging Houses at Ephesus (Figure 11.35).[31] Many of these paintings are known only from small fragments, but preliminary observations suggest that many plants represented in Pompeian paintings are seen throughout the empire: laurel, myrtle, pomegranate (Figure 17.4), oleander, quince or other apple-like fruits, and young trees, such as plane, oak, cypress, and pine.

MOSAICS

Plants are accurately depicted in the finer mosaics around the Roman Empire, and these have allowed scholars to more readily identify the common stylized examples.[32] The important examples from the Vesuvian region are found in the niches of *nymphaea*, such as the fine example from Massa Lubrense on display at the Museo Archeologico della Penisula Sorrentina at Piano di Sorrento (Figures 11.17A; 11.17.B). Here dwarfed trees, laurel, and other shrubs are shown in the finely crafted mosaic work.[33]

During the reign of Hadrian, plants were popular in mosaic design throughout the Mediterranean. The most exceptional examples of vegetal representation are those of the third to fourth centuries AD from the North African province. While many are purely ornamental, others represent specific plants of gardens and fields. The cardoon, which is not found in Vesuvian wall paintings, appears often in Tunisian mosaics (Figure 17.5A). Also depicted are other vegetables, such as the bottle gourd (Figure 17.5B), and asparagus and many fruits, such as the citron (Figure 17.5C), pomegranate, quince (Figure 17.5D), date, olive, grape, and fig. These mosaics offer a spatial arrangement of carefully identified plants, from grapevines growing in craters, cypress and fruiting trees, to laurel and flowering shrubs. For example, the well-known mosaic of the aviary of Carthage (Figures 12.9A; 12.9B) depicts cut branches bearing olives, plums, apples, pear, pomegranate, citron, quince, grapevine, together with laurel, pine cones, roses, daisies, carnations, lilies, jasmine, wildflowers, and even wheat. Also important are mosaics of cut

Figure 17.4 Still life painting with pomegranates, house II.1.12, Pompeii.

A

Figure 17.5A Cardoon, Utica, Tunisia, mosaic, now located in the Bardo Museum.

B

Figure 17.5B Bottle gourd, House of the Months, El-Jem, Tunisia, mosaic, now located in the Bardo Museum.

C

Figure 17.5C Citron, House of the Dionysiac Procession, El-Jem, Tunisia, mosaic.

D

Figure 17.5D Quince, House of the Dionysiac Procession, El-Jem, Tunisia, mosaic.

branches (Figures 12.1A; 12.1B; 12.1C), which offer a kind of catalog of ornamental and fragrant plants that were strewn across a floor. These are the combinations and plants mentioned in literary descriptions, such as that of Longus' *Daphnis and Chloe* (discussed in Chapter 10).

SCULPTURE

Sculptural reliefs represent a wide range of plants and are particularly valuable for providing religious, official, funerary, or other cultural contexts for the interpretation of plants. Sculpted craters, fountains, marble, and ceramic architectural decoration, altars, shrines, and funerary monuments appear in public and private gardens. As with painting, the Augustan monuments feature a high degree of fidelity and detail in the representation of plants, although fantastic *candelabra*, volutes, and other decorative forms were popular and equally finely rendered. The plants and vegetal motifs on the Ara Pacis are seen in other monuments of the Julio-Claudian and later periods around the empire. For example, the scene of the Tellus Mater on the Ara Pacis, surrounded by plants associated with fertility, such as clusters of poppies, and the reeds and plants of springs, is repeated in a plaque from Carthage, now in the Louvre.[34] Altars are rich in plant imagery. A triangular base for a tripod of the Augustan era depicts finely rendered laurels flanking a figure preparing a sacrifice at a round altar draped in garlands (Louvre inv. 358). Laurel is the plant closely linked to Augustus and is frequently and finely depicted, often in pairs, perhaps evoking those that flanked the door to his house on the Palatine.[35]

The range of plants depicted in sculpture and architectural decoration around the empire is, of course, vast, from the elaborate programs on imperial monuments, the abundant and carefully observed plants of the Ara Pacis in Rome,[36] and the Campana terracotta plaques that use palms and reeds to evoke Nilotic scenes, to modest tombstones depicting small offerings, realistically if less skillfully carved.[37] The small altar of Iulia Victorina (AD 75–100) from Rome, now in the Louvre, features a fine rendition of laurel with roosting birds (Louvre Cp 6225; Ma 1443). Sarcophagi from around the empire offer a range of carved plant motifs.[38] A great many reliefs provide images of sacred trees, such as oak, pine, or laurel. While these are typically represented as old and heavily pruned, young specimens had particular associations with vigor, as is perhaps seen in the stylized laurel trees and an oak leaf wreath that adorn a marble altar at the Temple of Vespasian at Pompeii (Figure 17.6). In other scenes the trees frame participants of processions in a manner that makes the trees appear to be part of the procession. Trees also serve as framing devices, as we see in the passion/tree sarcophagus from fourth-century Rome depicting biblical scenes and events separated by olive trees (Vat. 28591). A contemporary example from Arles depicts the wedding at Cana (FAN.92.00.2488). Such representations provide clues as to the cultural use of plants in a variety of religious, funerary, and landscape contexts.

VESSELS

Craters and other marble or bronze vessels were displayed in gardens and, in turn, sometimes featured finely rendered plant motifs. A crater featuring interlaced volutes rising from a base of acanthus was found near the tomb of Caecilia Metella in

Figure 17.6 Stylized laurel trees and oak wreath on marble altar, Temple of Vespasian, Pompeii.

Rome, although possibly associated with the nearby *horti* where it may have been featured in one of the gardens or courtyards. Its vegetal themes recall that of the Ara Pacis and may be part of a program of themes and figural language of official Augustan art.[39]

SUMMARY

Whether in painted, tessellated, or sculpted form, we see that the representation of plants in art offered multiple functions. Most plants in the cultures of the Roman Empire had local cultural and religious associations, familiar to the viewer, which infused the reading of altars, funerary monuments, and building decor. Other plants came to be associated with the imperial cult and contributed to readings of official programs in architecture, art, and coinage that were understood throughout the empire. The laurel, palm, myrtle, ivy, acanthus, and rose were particularly popular in this regard. In art associated with theater and oral traditions, certain trees and plants had strong regional associations and were used to establish the setting for specific scenes of comedy and drama. For example, the palm signified the Nile or other locations in Egypt, as well as in Arabia or Judaea. The distinctive silhouette of the umbrella pine signified Italy (Figure 17.7) and that of Cedar of Lebanon and the plane tree suggested eastern royal or Persian luxury. In some instances, the artistic representations of plants are offering simple displays of the abundant products of a villa garden within representations of seasons or the agricultural year. As our knowledge of plants from excavated gardens increases, we will be better able to see how this range of associations played out in actual gardens. The developing science of archaeological botany, discussed below, is critical to understanding the art of Roman gardens.

Botanical and Other Environmental Remains

Remains of plant material found in excavations furnish indisputable evidence for plants that were grown, or at least used, in Rome and its provinces.[40] It is rare to find macro-remains of garden plants, but it is not impossible. Furthermore, retrieval of plants from non-garden contexts contributes to an understanding of plant use in a region, critical to the interpretation of

Figure 17.7 Villa painting with cypresses and pines in silhouette, detail, announcing the presence of *viridiaria* in the villa to viewers from the sea, House of the Small Fountain, VI. viii.23, Pompeii.

gardens. At the time of this publication, the systematic retrieval of environmental remains on classical sites is not yet standard practice on most excavations in the Mediterranean, although it is more common in northern Europe. As a result, our discussion is confined to techniques that are showing promise, followed later in this chapter by a survey of archaeobotany around the Roman Empire, with a brief review of the involvement of archaeobotany in urban and designed landscapes of the region.

Gardens are not only ancient forms of art and places of cultivation; they are also ecosystems. Study of Roman plants involves the study of the garden's ecology, preserved through floral, faunal, and inorganic forms of evidence at the macro- and microscopic scales.

PLANT MACRO-REMAINS

Plant macro-remains are preserved in a variety of ways. The most common is through carbonization. In general, few gardens burn catastrophically *in situ*, although there are important exceptions, notably, those in the region buried by the eruption of Mt. Vesuvius in AD 79. Even there *carbonization* of plants during the eruption itself is haphazard. The towns closest to Vesuvius feature assemblages of plants carbonized at the time of the eruption, whereas Stabiae and sites at the periphery do not. At the Villa San Marco, the leaf of a plane tree was preserved as a cast in particularly fine volcanic ash, but such examples are rare.[41] In more typical preservation conditions, the carbonized plants found have been introduced to the garden as fertilizer from fuel, food debris, and other rubbish that was burned. In principle, there is the potential to find prunings and the remains of garden plants burned off by the gardener and returned to the soil, but instances of such practice are not yet well documented. When plants are burned, many of the parts usually used for botanical identification have been destroyed. Although the careful retrieval

of carbonized plants, through flotation and wet-sieving of soil samples, often yields disappointing results in terms of garden plants, the remains contribute contextual evidence of local cultivation practices that are, in turn, useful to the study of gardens.

In the deserts of Africa and Asia, as well as tombs and protected areas of other arid sites, plants are preserved through *desiccation*. The dedicatory foodstuffs of the Pharaonic tombs of the pyramids are the best-known examples, but similar evidence has emerged for the Roman era in Egypt, Masada in Judaea, and in particular circumstances of preservation elsewhere.

In the ditches of the northern provinces, as well as the wells, harbors, marshes, and coastal sites around the empire, *waterlogging* in anaerobic conditions helps to preserve plants. As discussed below, clippings and leaves of box from deposits in England, for example, have suggested the presence of nearby gardens.[42] Rich deposits of plant material from the Roman levels of the harbor at Carthage are discussed below and large deposits from Caesarea Maritima may one day shed further light on the movement of trees, shrubs, and food plants, including those grown in garden contexts around the Mediterranean.

Mineralization happens in certain soil conditions, and most commonly in latrines, which are often located near gardens. Minerals slowly replace the organic matter of the plant but its characteristic form is preserved. Alessandra Celant reported remains of "mummified" rose (*Rosa* sp.) found *in situ* in the Templum Pacis excavations in Rome, discussed below.[43]

The challenge of using macro-remains to determine the plants of a region lies in determining whether the fruit, nuts, seeds, or wood came in as imported produce (grown elsewhere) or whether the plant was grown in the area. Furthermore, in garden archaeology, it is necessary to ascertain whether a plant is from a specific garden, so one must differentiate between plants that were imported as foodstuffs, consumed, and deposited in the garden as debris or fertilizer from remains of garden plants preserved *in situ* or as clippings, burned off and redeposited by the gardener. To make these determinations, the archaeological botantist must either recognize plants that would not normally be part of an imported product, or find evidence of the plant in the record of pollen, phytoliths, diatoms, or aDNA at the site. Literary sources documenting the presence of plants cultivated in the region are also of value, though rare.

PLANT MICRO-REMAINS: POLLEN, PHYTOLITHS, DIATOMS, ETC.

Plant micro-remains are an essential source of information about the plants grown in a region. Each type of evidence has its strengths and limitations for understanding the specific plants of a garden.[44]

Pollen

Generally, the most abundant pollen remains are from wind-pollinated species in the region of the garden. Many garden plants are insect-pollinated and do not produce abundant pollen. Thus it is rare to find such pollen in the archaeological record – but not impossible. Wilhelmina Jashemski pioneered the use of palynology in the Vesuvian area, with varying degrees of success. Ultimately, however, a sufficient pollen record for the area, taken

both from lake cores and from garden sites, makes the Pompeii region one of the "most intensively studied gardens of the world."[45]

Archaeologists have debated the value of pollen as a standard method of gathering data on garden plants. Eberhard Grüger noted that pollen is not a reliable indicator of the plants of a garden, often because the pollen most abundantly represented is windborne and could come from long distances.[46] Yet, as Currie notes, "it seems that garden soils create their own microenvironments that make prejudgement on survival unwise."[47] Pollen evidence has offered important insights at Hadrian's Villa, Pompeii, and the Horti Luculliani in Rome. The new technique of extracting pollen from the plasters of garden features, mentioned above, is particularly promising and has the potential to become an important strategy in isolating the pollen of a specific site or garden. Dafna Langgut extracted pollen from the plasters of walls and features surrounding a Persian-era garden at Ramat Rachel, near Jerusalem, theorizing that plastering is often undertaken in the spring, when many plants are producing pollen. She detected species that must have been in the garden, as their pollen does not widely disperse. Langgut has also applied the technique successfully to Herod the Great's palace at Caesarea Maritima, finding preserved remains in a sample from a plastered column in the courtyard of the upper palace, where garden remains were not otherwise well preserved (Figure 17.8).[48]

Phytoliths

Plant phytoliths are "particles of hydrated silica formed in the cells of living plants that are liberated from the cells upon death and decay of the plants."[49] When the plant decays, these remains, many of which can now be identified taxonomically, endure in the soil. Not all plants produce phytoliths. While plant phytoliths in garden soils may characterize fertilizer or other additions, recent samples appear to represent plants that decayed in the garden itself.[50] Results are reported from Hadrian's Villa at Tivoli.[51] Remains of grass phytoliths have been found in samples from the walks of the Great Peristyle of the Villa Arianna at Stabiae (Figure 17.9), offering preliminary evidence for turf.[52] Phytoliths from palms have been found at samples from garden beds at the Pool and Garden Complex at Petra,[53] as well as from the garden beds at Stabiae.

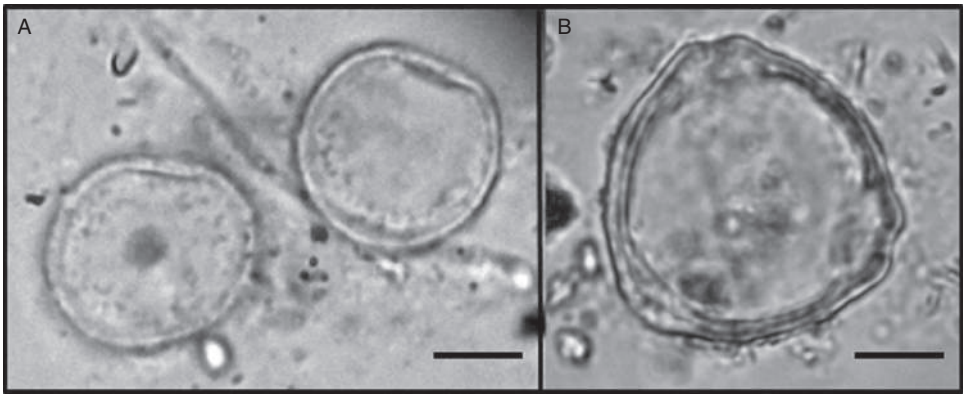

Figure 17.8 Pollen grains extracted from the base of the northeast column in the palace courtyard in Caesarea Maritima. A Two pollen grains of *Cupressaceae*. B *Corylus* sp. pollen. Each bar = 10 μm.

Figure 17.9 View of planting bed with densely spaced root cavities in the Great Peristyle of the Villa Arianna at Stabiae.

Diatoms

Diatoms are single-cell algae, which preserve well in the sediments of ponds and lakes, and may even be preserved in the larger pools and basins of Roman gardens. Diatoms have been used to determine if water is salt or fresh, as well as how placid it may be.[54] These have yet to be extensively studied in Roman garden contexts, although Carlos Cordova has examined samples from the Petra Garden and Pool Complex, finding diatoms, together with sponges and grass phytoliths, that suggest a well-irrigated environment.[55]

Mollusks

Plant remains are limited in their ability to convey the height and density of shrubs and trees, as the Romans had many ways of clipping and shaping plants above ground. The study of land snails gives us an additional piece of evidence, as each variety of these small creatures prefers a particular habitat, whether it be low and sunny on annual plants near to the ground, or higher up in the canopy of shrubs and trees. Mollusks also lend additional ecological data on soil moisture, exposure, etc. Ezequiel Pinto Guillaume's studies of mollusks from the Villa of Livia at Prima Porta and the Villa loc. Santa Maria at Lake Nemi, Italy, have contributed to our understanding of those gardens and are now being applied to other sites around the Roman Empire.[56] For example, mollusks retrieved from two large garden beds in the Great Peristyle of the Villa Arianna at Stabiae were mapped to indicate relatively dry versus more heavily irrigated areas of the garden.[57] Mollusks also provide evidence of environmental change over time near water features, as well as larger landscapes along a lake or coastline. This type of evidence has been applied to the study of Lake Avernus, as well as to other sites around the empire.[58]

Genomic Studies

Ancient DNA (aDNA) can be retrieved from waterlogged, dessicated, and frozen remains, and in some instances from carbonized samples. DNA can be helpful in identifying plants where diagnostic features are poorly preserved or when only the family or genus can be determined. Furthermore, DNA can contribute important information on genomic regions and species diversity, which can allow botanists to establish how an introduced plant became established in a region over time. Such studies have been undertaken on Roman fruit tree species north of the Alps,

where DNA has helped to identify the origins of these introduced plants, based on analysis of alleles or haplotypes known to reflect a geographically structured distribution.[59]

RECENT SCHOLARSHIP

We turn now to a discussion of the state of scholarship in Roman archaeobotany in the different regions and provinces of the Roman Empire and the conclusions that have recently been reached, particularly those of relevance to gardens. This section begins with Italy, moves through Europe and Asia, and concludes with Africa.

The contribution of archaeobotany begins, minimally, with simple lists of plants, and we highlight those that may be of significance to garden studies. Other areas have well-established archaeobotanical knowledge for much earlier periods and offer a foundation of knowledge about plant cultivation and importation, but suggest little about plants of the Roman era. In the most developed areas of archaeobotany, we begin to see the patterns of plant consumption, trade, and cultivation in the Roman period. With a good pollen and macrobotanical record, it is possible to compare the data to determine whether plants were cultivated in the area or whether they are likely to have only been imported as foodstuffs, medicines, wood, craft or construction materials, or other wood products. In the most current studies of plant genetics, archaeobotanists are not only providing close identification of plants but also are demonstrating how gardeners and farmers in Italy and the provinces endeavored to acclimatize imported plants to their region. Finally, we will see discrete projects that have provided useful results for specific kinds of sites, practices, or comparisons with ancient literary evidence.

Italy and the Mediterranean Coastal Areas

Archaeological evidence for the role of plants in gardens is relatively well developed for Italy but elsewhere the archaeobotany of urbanism has yet to be synthesized.[60] A vegetation history of Italy in the Roman period based on archaeological assemblages remains unavailable, although Rottoli has published a valuable bibliography.[61] The most important studies Wilhelmina Jashemski knew outside of the Vesuvian region were those of agricultural landscapes at Settefinestre.[62] A synthesis is needed for archaeobotanical studies, pulling together the field data and bibliographies for various projects.[63]

In the region of Rome and Campania, archaeobotanists have successfully identified plants of Roman gardens, if to a limited extent. Furthermore, ceramic planting pots (*ollae perforatae*) and preserved planting pits are abundant in gardens of this area, allowing the identification of plant locations within gardens even when the exact species of plant is not known. At Pompeii, Wilhelmina Jashemski pioneered the systematic sampling and identification of pollen and wood by using a scanning electron microscope, as well as the flotation of soil samples to recover carbonized plant remains. The eruption of Mt. Vesuvius created a wide variety of preservation circumstances in the gardens she inspected, rather than a reliable and

constant state of preservation of plants. At Oplontis, she tried a sampling grid for pollen over a large area of the north garden, only to have her palynologist, G. W. Dimbleby, stop her after no results were found; yet in other areas at Oplontis pollen was found but in concentrations too low to permit certain identification of garden plants.[64] This remains the case today. In some locations plant remains are found carbonized or mineralized after the eruption, while carbonized plants retrieved from soil samples are largely typical of those from Roman gardens around the empire, typically containing burned or mineralized food waste.

Wilhelmina Jashemski structured much of her study of gardens around the documentation of root cavities in the soil of the garden. In some instances, the root cavities were distinctive, such as in the case of staked vines or oleander. However, roots are not used by botantists to identify plants, so she turned to the extensive practical experience of Carlo Fideghelli, who had spent his career studying diseases of the roots of fruit trees. He published no scientific papers on this work, as it relied on his experience rather than scientific method. However, his informed assessment narrowed the range of possibilities. In recent years, her method has been somewhat misunderstood. However, she systematically cast the root cavities, proposing a marker for the size and location of the roots for future study, and offering notes and specialist observation during that key moment of discovery that, as in all archaeological excavation, can never be replicated.

Ultimately, Jashemski found it impossible to assemble a uniform "toolkit" of techniques that would work for all Roman gardens. Rather, each site had specific preservation opportunities and problems she addressed in recovering, recording, and interpreting the evidence. A comprehensive catalog of the plants she found in her work was assembled in the *Natural History of Pompeii*, together with studies of regional pollen and other environmental studies.

The region buried by Mt. Vesuvius continues to foster scholarship on the botany of Roman gardens. Since the conclusion of Wilhelmina Jashemski's fieldwork in 1983, the Superintendency has exposed the garden and a "hanging garden" of the House of the Chaste Lovers (IX.12.6–7).[65] In both gardens, pollen was successfully retrieved, representing an impressive variety of trees, shrubs, and climbing plants, as well as herbaceous plants. The excavators conclude that it is difficult to determine which plants grew in the garden and which grew nearby, but they propose that umbrella pine and juniper grew in the complex, and the hanging garden may have had a kind of meadow composed of herbs typical of the area.[66] There have also been studies in the Temple of Venus, and stratigraphic excavations in the House of the Greek Epigram.[67] Archaeologists have studied the *viridiarium* of House V.4.3,[68] where, among other remains, they have identified myrtle, which might have formed the garden hedge, and charcoal from fruit trees of the subfamilies *Maloideae* and *Prunoideae*.

The newly exposed garden of the Great Peristyle at the Villa Arianna at Stabia has produced a variety of plant remains in the form of pollen, phytoliths, charcoal, and root cavities, as well as carbonized plants. Phytoliths, identified from samples taken along the walks and beds, indicate the

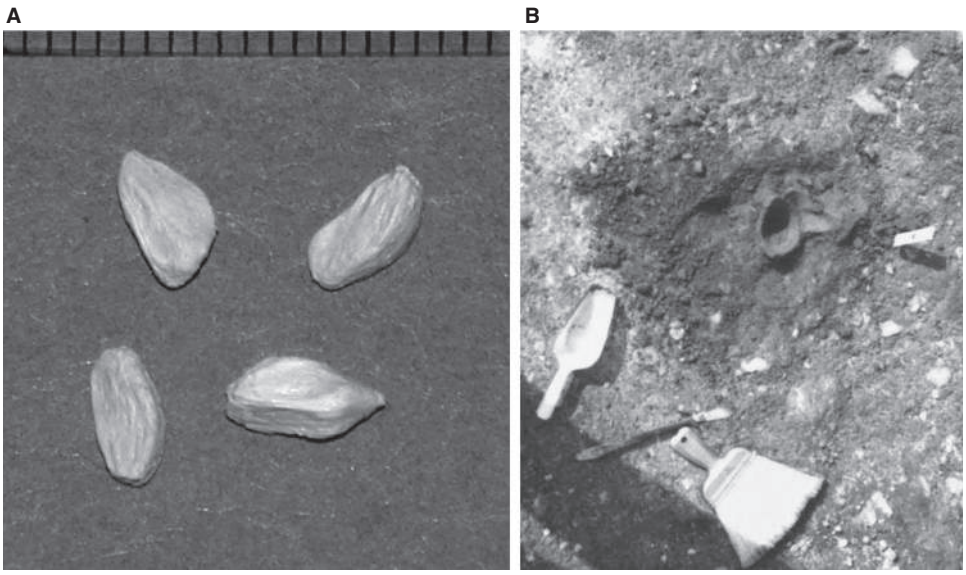

Figure 17.10 A "Mummified" remains of *Rosa* from the Templum Pacis; B the archaeological remains of the planting pit with half-*amphora*.

likelihood of turf on the paths, as well as palm trees in the beds. The carbonized remains are of fuel and food debris. The garden features approximately 250 root cavities, representing shade and fruit trees, multistemmed shrubs, and herbaceous plants (Figure 17.10).[69] Mark Robinson's work has pioneered botanical studies from stratigraphic excavation, rarely done given the well-preserved surfaces at Pompeii.[70] However, once archaeologists move beneath the surface preserved by the eruption, the preservation is not extraordinary and the problems of interpreting identified plant remains are similar to those found at Roman sites elsewhere around the Mediterranean.

New questions about plant use have also been addressed for Pompeii, such as horticultural practices, medicinal uses, and funeral offerings.[71] These studies have been summarized by Ciaraldi, who has brought her work with microscopic remains to the study of the ancient city from the sixth century BC through the time of the eruption of AD 79.[72] Emilia Allevato and Gaetano di Pasquale have summarized archaeobotanical data from the north slope of Mt. Vesuvius, offering a picture of managed woodland, cultivation, and agricultural production on the slopes of the mountain.[73] Michele Borgongino has worked on the vegetal remains of Pompeii and the surrounding area. Finally, Annamaria Ciarallo of the Superintendency has published her observations on ancient plants for the benefit of the public.[74]

Outside of the Vesuvian region, archaeobotany has been undertaken on garden sites from the Prima Porta excavations and the recovery of some of the plants used in the later years of Horace's Sabine Villa[75] to garden research at Hadrian's Villa, where potted plants and exotic finds complement the Egyptian style of the Antinoeion.[76] Archaeobotanical retrieval was also undertaken in the peristyle gardens at the Villa at loc. Santa Maria near Lago di Nemi, revealing more about the fertilizer than garden plants.[77] In Rome, the center of the empire, plants of the Horti Luculliani have been identified.[78] We also have the extraordinary discovery of rose remains

in the garden of the Templum Pacis, one of the imperial *fora* (Figure 17.10).[79] These remains, associated with planting pots *in situ*, have helped to reconstruct the ancient appearance of the whole temple precinct, regarded in antiquity as one of the most beautiful in the city. Systematic archaeobotanical retrieval was conducted on the east Palatine, although no gardens were identified.[80]

The Provinces of Europe

In the northern provinces, the period of Romanization is marked by the introduction of a wide variety of plants cultivated in the Mediterranean. The fig and olive could not stand the cold winters, nor could the umbrella pine, which furnished the popular pine kernels and, along with the cypress, provided the distinctive silhouette that signaled from a distance a Roman *viridiarium*. The myrtle, laurel, and rosemary, so popular in Italian ornamental gardens, grew only in warm areas. The box, however, could stand a cooler climate, and grew well in Britain and Germany, as could the cornel cherry. The large number of varieties of Mediterranean plants available made it possible to find some that would thrive in quite different soils, climates, and exposures.

There has been lively discussion as to whether evidence of vineyards is conclusive for Britain and Germania inferior (the Lower Rhine province).[81] Good commercial systems made it possible to import wine, raisins, dried figs, pine cones/kernels, wine, and olive oil, as well as some spices and medicinal plants. Dates, which could not ripen in Europe – except, according to Pliny,[82] in one small region in Spain – were imported from the warmer provinces. These are all represented in the archaeological record, but only evidence from texts, pollen, or remains of the noncommercial parts of the plant can confirm that they were grown in the gardens of the region in which they were found.

HISPANIA

Archaeobotanists in Spain are rapidly increasing the data on the plants of the ancient Roman Hispanic provinces.[83] The evidence, as Peña-Chocarro points out, comes from across the entire peninsula.[84] An interesting report comes from the Roman town of Oiasso (modern Irun, in Basque country), situated in an area between the Ebro Valley, the Pyrenees, and the Cantabric Sea, where archaeobotanical evidence indicates plants and fruit trees common in Roman kitchen gardens.[85] Unfortunately, as the authors of the study point out, the data are generally insufficient to distinguish whether fruit remains are Roman imported goods or examples of local cultivation. In addition to fruit trees, evidence from the ancient town of Ilerda (modern Lleida in Catalonia) indicates that vine cultivation in Roman times expanded and new plants, like celery and fennel, appear to have been introduced.[86]

BRITANNIA

Early work on Romano-British palaeoethnobotany relevant to garden studies was first summarized by Barry Cunliffe in 1979.[87] Pollen studies from his excavations at Fishbourne had not produced evidence of any plants that could be convincingly linked to gardens. J. R. A. Greig noted that the unfavorable combination of gravel and clay soils, together with

the Roman practices of trimming hedges and cultivating insect-pollinated species, were factors.[88] However, organic materials found in a stream bed outside of the villa, an area thought to be a designed landscape, were identified by Greig as hazel, willow, ash, fir, oak, and blackberry, an assemblage that reflects the composition of the coastal strip today. Of particular note is the work of Clement Reid, who collected and studied waterlogged sediments from wells and rubbish pits during the excavation of the Roman town of Calleva Atrebatum (Silchester) between 1890 and 1909. Beginning in 1900, he published annually a list of the plants identified from seeds and pollen.[89] This list has been augmented by the identification of plants in similar deposits found during the excavation of towns, villas, and forts throughout Britain. Camilla Dickson[90] summarized and critically evaluated this evidence in 1991, noting forty-three different plants that may have been grown in orchards or gardens.[91] Marijke van der Veen, Alexandra Livarda, and Alistair Hill have provided a recent assessment – reviewing plants introduced by the Romans, as well as their dispersal, and suggesting who may have had access to the new resources.[92]

GAUL

Crossing the channel from Britain to the Loess belt of modern France, Belgium, the Netherlands, and German Rhineland, we find a good review by Corrie Bakels of the agrarian history of the region before and during the Roman period.[93] There have been nearly one hundred reports of botanical evidence from Gaul, and while many assemblages are too small to be representative, great regional variation is seen in the evidence overall. As in many areas, the Iron Age archaeobotany is better understood than that of the Roman period. While this research is helpful in knowing the plants in use preceding Roman rule, in many regions data for a rigorous comparison unfortunately remain insufficient. Archaeobotanical evidence at the villa of Selongey and the villa de Richebourg in Gaul attest to the culture of fruit trees and viticulture.[94] Rescue excavations in Horbourg-Wihr retrieved concentrations of fruit pits and shells in rectangular pits dating from the first to the third centuries AD. These were thought to be either latrines or material being stored for fertilizer.[95]

GERMANIA

The evidence recovered in the Lower Rhine region in Germany is especially rich. Karl-Heinz Knörzer studied plant material from more than 250 excavated settlements dating from the Neolithic period to modern times. From the excavations of fifty-eight Roman settlements, he obtained soil samples, rich with non-carbonized plant remains, from latrines, refuse pits, and other contexts. He identified sixty-three cultivated plant species dating to the Roman era, compared with only twenty-two species in the preceding eight hundred years. The Roman conquerors had imported cultivated plants from the south, among them seventeen cultivated fruit trees, berries, and nuts. This marks the beginning of fruit cultivation in the Lower Rhine district. Knörzer also identified the carbonized remains of imported foods, which illustrate the good commercial relations between the Rhineland and the Mediterranean countries. Rice, olives, figs, dates, and pine nuts, from plants that

could not survive the severe winters of the north, were imported.[96]

This evidence has been assessed by Corrie Bakels and Stefanie Jacomet in conjunction with a wide range of palaeoethnobotanical finds from central Europe. While their work specifically considers luxury plants that were not grown in these provinces, they note instances where the botanical remains suggest that efforts were made to do so, successfully or not.[97] As Günther Thüry has pointed out, the data available for other parts of central Europe are still too scarce for good reviews.[98] To hypothesize about plants that might have grown in Austria Romana, for example, the corpus of evidence from Switzerland,[99] Germany, France, and Britain has to be used.[100]

In the available reports, we see that the Romans considerably increased the known range of plants available in the northern provinces. As stated above, some of the plants most prominent in ornamental gardens in the Mediterranean do not survive in gardens farther north, but archaeological evidence suggests that attempts were made to grow at least some of those plants where possible. Both Britain and Germany successfully cultivated the box and a variety of herbs popular in Italian gardens.[101] A reassessment of some box leaves from a *villa rustica* of the Rhineland even shows possible signs of clipping (Figures 17.11A, 17.11B).[102]

Of course, in return, northern plants were brought to Rome from the temperate climates, such as a fine alpine specimen shown in the garden painting at Prima Porta.[103] We also know from literary sources that Emperor Tiberius loved to eat *siser* from the Rhine river.[104] As he himself had spent some years in the Northwest when fighting against the German tribes from 4 to 6 BC, he started to like the root vegetable so much that he asked for yearly imports. The identification of the *siser* is still much discussed but we might consider parsnip (*Pastinaca sativa*),[105] whose wild forms are widely distributed over temperate Europe and Turkey but which are archaeobotanically only rarely identified.[106] The variety from the Rhine river was regarded to be rather hardy and thus Romans tried to cultivate it in the South, supposedly with limited success. It will be interesting in the coming years to better document the influence of the northern provinces on the archaeobotanical record in Italy. Those who have moved from the dry summers of the Mediterranean to the startling lush greens of the temperate North can well imagine that Romans sought to bring some of that verdancy back home.

PANNONIA

Many of the same developments we have outlined for the northwestern provinces can be seen in the Roman province of Pannonia, the western part of modern Hungary. With the Romans many new garden plants arrived in the area, at least up to the river Danube. The archaeobotanist Ferenc Gyulai writes: "today's orchards and vineyards trace their ancestry back to Roman foundations."[107]

Overall, the presence of fruit stones indicating the cultivation of cherries, plums, and peaches in the northwest of Europe is now regarded as a sign of Roman culture. Their presence in northern Spain is also likely to have relied upon the expertise associated with other aspects of Romanized agriculture indicated by new crop and garden plants.

Figure 17.11A Boxwood leaves with clipping marks from a *villa rustica* of Weisweiler.

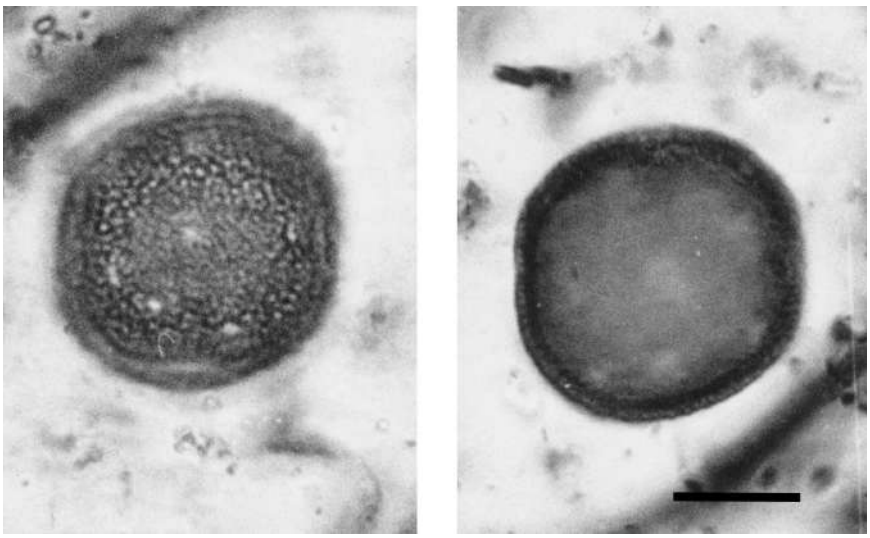

Figure 17.11B Boxwood pollen.

THE BALKANS

Archaeobotanical findings from the Roman provinces of the Balkan peninsula are still rare, although investigations of the emergence of agriculture in earlier eras in some areas are beginning to provide a picture of plants long cultivated at the time of Roman conquest.

Data from Greece have been systematically summarized through the Hellenistic period by Fragkiska Megaloudi and, most recently, Alexandra Livarda.[108] Both surveys emphasize the insufficient evidence from the Hellenistic and Roman levels in Greece to offer even a hypothesis about local agriculture, plant introduction and usage, or comparisons with earlier eras. Plants used in Hellenistic funeral ritual, however, include many that were likely to have been grown nearby, so these ritual offerings may provide circumstantial evidence of local cultivation.[109]

In Croatia (the Roman provinces of Illyricum, then Pannonia and Dalmatia), Renata Šoštarić is gaining insight on Roman-period related plant finds. Remains such as those from the Roman port at Zaton near Zadar (Dalmatia) provide important contextual information and will help to tell us more in the future about the plant trade in Roman times and plants grown locally in Croatian gardens.[110] Two

reports from modern Serbia date mainly to the Late Antiquity/early Byzantine periods. These primarily concern cereals and legumes, one from the Late Antique fort of Viminacium (site of Svetinja), one from ancient Felix Romuliana (modern Gamzigrad).[111]

In Slovenia, in addition to a few older archaeobotanical reports for the Roman period, exciting new research at the ancient settlement of Nauportus (modern Vrhnika) is being conducted by Tjaša Tolar.[112]

The Provinces of Asia

Ancient texts recount the eastern Mediterranean origins of many of the plants the Romans knew in Italy. Several of these arrived with Greek settlers or during the Hellenistic period, but their eastern origin was not forgotten. Perhaps the most iconic of these in literary sources is the plane tree.[113] Other plants were eagerly brought home from the Asian conquests, even displayed as booty in triumphs,[114] and cultivated as climate permitted.

ASIA MINOR, SYRIA, AND JUDAEA

Asia Minor was regarded by Greek and Roman sources as one of the places where wine and saffron crocus originated, as well as the locus for exchange of plant and garden knowledge between Greeks and Persians, and later, Romans and Persians.[115]

The archaeobotany of Anatolia was last surveyed by Mark Nesbitt in 1996, at which time some thirty archaeobotanists were working on sites dating from the early origins of agriculture in the tenth century BC to the pre-Classical periods. As many of these projects focus on tells, medieval finds are also reported.[116] However, systematic archaeobotanical recovery from Classical sites is rare. Of these, pre-Roman remains have been studied from specific contexts at Miletus, Sardis, Troy, and Gordion. Sagalassos, discussed below, is the exception and model. Although it is not yet possible to sketch an overview for the Hellenistic and Roman periods, we can look at the rich contributions offered by specific projects underway at sites such as Sagalassos, Sardis, Aphrodisias, and Gordion. Given the rich range of plants documented for the pre-Roman period, it will be valuable to compare Hellenistic and Roman remains for insights on how various plants came to be known, in the texts, as originating in specific areas of this region.

The first project to investigate the vegetation of a designed landscape of the Roman era in Asia Minor recently took place at Aphrodisias (Geyre, Turkey), where the South Agora (215 × 70 m) has proven to be a large public park focusing on a central pool flanked by linear planting beds.[117] Remains of a palm leaf in the sediments of the pool suggest that Cretan palms may have been planted in the beds, as mentioned in an inscription of Artemidorus Pedias, who promised to "adorn a palm grove with a statue of Hermes, and a gilded Aphrodite with Erotes holding lamps on either side and a marble Eros in front."[118]

Apparently the first program of systematic recovery of archaeobotanical remains in a classical city has occurred recently at Sagalassos, a late Hellenistic and Roman settlement. The plant macro-remains recovered by a team under the direction

of Thijs Van Thuyn are being compared with regional pollen analyses carried out by Marleen Vermoere. Among the trees that may have been cultivated in garden or park settings, as well as orchards, are almond, hazel, walnut, pine tree (most probably imported), and possibly pistachio.[119]

Preservation of large assemblages of Lydian foodstuffs, carbonized *in situ* at Sardis, offers a particularly vivid portrait of pre-Roman plants in a domestic context.[120] Identification of carbonized plant remains, mainly carbonized macro-remains found during excavations from the Roman period, has been made by Miller and Nesbitt.[121] Pollen cores have been taken from lakes on the Hermes Plain and Mt. Tmolus, offering a valuable contextual record for future studies. Similarly, the tombs from Gordion, as well as systematic botanical retrieval at the site by Naomi F. Miller, show the richness of plant resources available to the kings of Asia Minor.[122]

The situation is similar for Syria. For the Roman era, texts remain the primary source of knowledge of plants for gardens, although archaeological botany will ultimately be a richer source of knowledge when the Roman levels of archaeological sites are more fully assessed.[123] Pliny speaks of the Syrian jujube (*ziziphus*),[124] which had just recently come to Italy,[125] the date and the pistachio, several varieties of figs, and the damson plum and the sebesten (*Cordia myxa*),[126] both from Syria and, in the first century AD, grown in Italy.[127]

As discussed above, Judaea/Palestine offers a wide range of evidence from texts, such as the Bible and Talmud. According to these texts, the region was known for its excellent produce, such as the balsam, dates, pears, Persian nuts, and many other fruits that had been introduced during or before the Hellenistic age. Excellent fruit was grown around the Sea of Galilee.[128] Archaeobotanical evidence from the prehistoric periods shows the long history of plants in the region. In recent years, the Hasmonean and Herodian sites have been more systematically sampled. Gleason has conducted archaeobotanical studies of garden sites of Herod the Great, generally finding that the macro-remains represented amendments to the garden soil.[129] As noted above, new strategies for the use of pollen evidence to determine garden plants are now being applied to Roman sites by D. Langgut. Cypress and hazelnut are among the plants identified in the upper courtyard of Herod's maritime palace, where gardens are not otherwise preserved (Figure 17.8).[130] Jennifer Ramsay has studied botanical remains systematically collected from various excavations at Caesarea Maritima, including Herod's maritime villa.[131] Dessicated plant remains, studied by Mordechai Kislev, and *amphorae* marked with imported and local produce were found at Herod's fortress palace at Masada overlooking the Dead Sea.[132] The date palms of this region were prized for their variety in taste, and date pits are found ubiquitously during the excavations; however, it was a great surprise when a dessicated date pit from Masada, carbon 14 dated to the time of Herod, germinated in 2008 using a plant growth medium (Figure 17.12). Named "Methusala" when it first appeared, the plant is a healthy male Judaean palm, an extinct variety related to the Egyptian palm.[133]

The deserts of this area and Arabia Petraea were renowned for their trade in,

Figure 17.12 "Methusala," a male Judaean palm grown from a desiccated seed from Masada.

and production of, aromatic plants. The evidence has been surveyed by Erickson-Gini and Yigal Israel.[134] The famous balsam of Judaea, grown in *paradeisoi* near the Dead Sea, has continued to elude certain archaeobotanical identification, but recent attention has been devoted to solving the mystery.[135]

ARABIA PETRAEA

Botanical studies are emerging from recent excavations in Arabia. In addition to the phytoliths of palm mentioned above, Ramsay has published the first macrobotanical findings from the Petra Pool and Garden Project.[136] The samples appear to represent amendments to the soil rather than garden plants, consisting of cereals (barley and wheats), common weeds, and seeds of fruits and nuts (olive, grape, fig, date, walnut) that are likely to represent foodstuffs. She notes the need for irrigation, if these crops are grown in the area, and points to the discovery of a vineyard at Beidha.[137]

The Provinces of Africa

In the provinces of Africa, the Romans knew of well-established agriculture long before acquiring these territories. Pliny the Elder and other Latin authors cite Mago, an important agricultural writer from Carthage, although his works are not otherwise preserved. The potential of these areas was further exploited by the Romans with provision of water from aqueducts, such as the Zaghouan aqueduct, which fed Carthage. Archaeobotanical studies in Africa are beginning to be carried out on a regional basis, and assemblages have been systematically retrieved at selected sites in Libya, Tunisia, and Egypt.

Egypt is an exception to the general archaeobotanical picture of northern Africa, having a long, unique tradition of agriculture and being one of the key distribution networks for trade with Southeast Asia and East Africa, surveyed recently by René Cappers in the publication of Berenike and Marijke van der Veen at Quseir al-Qadim.[138] Bagnall gives a valuable list of the plants and trees grown in Egypt that are mentioned in the Greek papyri or otherwise attested, particularly from excavations.[139] A large collection of dessicated plant remains of known provenience in the Manchester Museum in England includes a corpus of unpublished Roman-era garlands from Petrie's excavations in the Fayum. The garlands include imported plants as well as those that might have been grown in plant nurseries: lotus and East Indian lotus (*Nymphaea lotus* and *Nelumbo nucifera*), pomegranate, rose, Egyptian acacia (*Acacia nilotica*), marjoram, rennet berries (*Withania somnifera*), chrysanthemum (*Chrysanthemum coronarium*), narcissus, and date palm fruits.[140] Large pieces of unidentified resin from Hawara are also in the Roman collection of the Manchester Museum. Dessicated plant remains from Ptolemaic and Graeco-Roman sites have been contributed to the museums and were recently cataloged by Cappers and Hamdy.[141] Studying garlands, Hamdy notes that rose, myrtle, and rose of heaven appear to have been added to the repertoire of garland plants in the Graeco-Roman period.[142]

Archaeological excavations of Roman gardens in North Africa were first conducted by Wilhelmina Jashemski at Thurburbo Maius. She found root cavities, but no archaeobotanical remains that could help her identify the plants. Her interpretations were based on plants in texts, inscriptions, and mosaics. Although gardens have been identified elsewhere, we do not have archaeobotanical reports of plant remains that can be directly linked to any known sites of gardens. As elsewhere, with sufficient evidence we can compare the macroscopic remains with the pollen record to ascertain if plants were grown locally or imported.

This level of assessment has been conducted at Carthage, Tunisia (Roman province of Africa Proconsularis, Africa Vetus, Africa Zeugitana). Plant macro-remains from the Punic, Roman, and Byzantine eras at Carthage have been compared to ancient pollen samples, allowing us to discern which plants were cultivated locally versus those imported from elsewhere as foodstuffs. Among trees that could be grown in gardens are fig, olive, plum, grapes, almonds, and pomegranates, as well as crop plants such as artichoke, melon/cucumber, pea, and manna ash. Popular garden trees such as umbrella pine, hazelnut, and walnut can only be confirmed as imported food products. Although absence of evidence is not conclusive, it is also striking that no remains of date or palm have been seen for any period in the archaeological record of Carthage.[143]

Even in the sub-desert region of the Ghirza and Libyan valleys, run-off agriculture permitted a range of Mediterranean plants to be grown from the first to third centuries AD.[144] These include olives, vines, figs, and almonds, as well as the crop plants of cereals and pulses.

CONCLUSION

Recent archaeobotanical recovery of plant remains from all contexts in

archaeological excavations has demonstrated the potential to allow us to determine the plants grown in the area of a site, rather than simply imported as foodstuffs. Such judgment is made possible by the recovery of processing remains as well as parts of the edible plant and by comparing the plant macro-remains with an assessment of plant micro-remains of the area. Genetic studies have the potential to refine this comparison further to assess how plants were adapted to a region.

The known cultivation requirements of these plants make it possible to ascertain which were grown in orchards and gardens. Although it is difficult at this time to know the plants of a specific garden, having a general picture of the garden plants of a region enables us to better interpret its garden culture, as well as to provide more nuanced reconstructions of gardens. The available syntheses also show the extent to which the same plants were grown throughout the provinces, climatic conditions permitting, and the extent to which plants raised by the pre-Roman inhabitants continued in favor. Many cultures, including the Roman, did not give up their traditional foods, which often were tied to their cultural identity and practices, but simply added new and varied items. Current archaeobotanical studies are showing specific ways in which both the Romans and their imperial subjects benefited from the extensive plant trade and distribution systems of the empire.