

IN THE BEGINNING

370 BC—290 BC

THEOPHRASTUS IS THE first in the long list of men who fought to find the order they believed must exist in the dizzying variety of the natural world. He lays out the puzzle, nudges together a few pieces that he thinks might fit. Fitfully, over the next 2,000 years, the puzzle is taken up by a series of philosophers, doctors, apothecaries, each of whom adds to the picture, links a few more pieces together, until finally, by the end of the seventeenth century, the whole picture begins to make sense. We now have written descriptions of 422,000 plant species. Theophrastus knew about 500, half of which had already appeared in Greek poetry, plays, essays (Homer mentions sixty). But Theophrastus was the first person to devote serious attention to the business of naming plant names. He was the first person to gather information about plants, and to ask the big questions: 'What have we got?' 'How do we differentiate between these things?' He was the first person to discuss plants in relationship to each other, not just in terms of their usefulness to man. Magic and medicine both provided powerful practical incentives to know more about plants, but Theophrastus wanted to know them in a different way, just for the sake of knowing. From that knowledge, connections between plants gradually emerged which helped to make sense of the natural world and its terrors. The Greeks believed passionately in order.

On the north side of Syntagma Square in Athens, there is a boundary stone, of old unpolished marble, incised with the remnants of an inscription. It is only about two feet tall, but it is set on a much newer swagged column, which makes it almost

as tall as the kiosk close by selling fizzy drinks and ice creams. The stone marks the boundary of the Lyceum, the school where Theophrastus taught in 320 BC. Forget the traffic hurtling with suicidal speed round the dusty circuit of Syntagma Square. Forget the hoardings, the looming presence of the Hotel Grand Bretagne, the Greek guards in their crazy bobble shoes. See instead Theophrastus, pacing up and down in front of his audience (more than 2,000 people came to hear his morning lectures at the Lyceum).¹ In one hand, he has a leaf from the plane tree that shades the stream running through the Lyceum grounds, in the other, a vine leaf. The leaves are roughly the same size, roughly the same three-cornered shape. Can this mean that there is some kinship between them? But the vine produces an edible fruit. The plane tree does not. Does this rule out the possibility of any relationship between the two plants? And the plane grows tall, in our measurements, thirty feet or more. The vine is a shrubby kind of plant, never attaining the stature of a tree.

Is the difference in height, in general habit of growth, a useful, valid way of distinguishing between things, of grouping them? Theophrastus thought it was and explained to his pupils why he favoured separating plants into four different categories: trees, shrubs, sub-shrubs and herbs. That does not sound much of a breakthrough to us. But we have to unknow such a vast amount of knowledge to get back to Theophrastus and the world he was trying to understand. There had been no Darwin. No *Origin of Species*. No conception of evolution. The early Greeks saw cultivated types of grape, plum, peach, apple as gifts from the Gods, in benign mood after a particularly good day on Mount Olympus. The Ionian philosopher Hippon had already suggested that cultivated plants may perhaps derive from wild ones, but it was a wildly radical thought to absorb. Theophrastus noted it as an interesting proposition, but still suggested a division between wild plants and cultivated ones as a primary mode of classification. He knew nothing about the mechanics of pollination and yet, in writing about date palms, noted that 'it is helpful to bring the male to the female; for it is the male which causes the fruit to persist and ripen, and this process some call, by analogy "the use of the wild fruit". The process is thus performed: when the male palm is in flower, they at once cut off the spathe on which the flower is, just as it is, and shake the bloom with the flower and the dust over the fruit of the female, and, if this is done to it, it retains the fruit and does not shed it.' This is where the biggest chasm looms between our mind-set and his. How could he so accurately describe the process of pollination without going on to ask himself why this particular trick worked? He understood the concept of a male and a female plant.² He understood that a good fruit set depended on the female flowers being visited by the males, but he never puzzled out the concept of pollination. Seeds and fruits came, but the how of it was a mystery.

He tells us what other authorities have to say on the matter: the Greek philosopher Anaxagoras (c.500–428 BC) believed that all things were made from minute particles arranged by a supernatural intelligence. To him, the air contained seeds of all things, and these, washed down by rain, produced all the plants on earth. The Athenian historian Kleidemos believed that plants were made of the same elements as animals, but that they fell short of being animals because their composition was less pure and they were colder. The Greek poet Hesiod said that the oak produced not only acorns, but also honey and bees. So instruments of pollination, such as the catkins of the hazel tree, seemed to him to have absolutely no purpose. Theophrastus described them minutely:

The filbert after casting its fruit produces its clustering growth, which is as large as a good-sized grub: several of these grow from one stalk, and some call them catkins. Each of these is made up of small processes arranged like scales, and resembles the cone of the fir, so that its appearance is not unlike that of a young green fir-cone, except that it is longer and almost of the same thickness throughout. This grows through the winter (when spring comes, the scale-like processes open and turn yellow); it grows to the length of three fingers, but, when in spring the leaves are shooting, it falls off, and the cup-like fruit-cases of the nut are formed, closed all down the stalk and corresponding in number to the flowers; and in each of these is a single nut.³

He described only what he could see with his own eyes. Spectacles had not yet been invented. Nor had the magnifying glass or the microscope. He could see the veins in a leaf, but not the stomata, the tiny pores that control the passage of oxygen and carbon dioxide in and out of the plant. But of course he did not know anything about oxygen or carbon dioxide or the way leaves breathe.

His mentor and master, Aristotle, led the way with animals, and in his treatment of plants Theophrastus started with a concept of the plant as an animal with its feet in the air and its mouth in the ground. In some ways, he could make the analogy work: like animals, plants could be described in terms of their veins, nerves and flesh. And he worked most often by analogy: this leaf is bigger, smaller, hairier, lighter in colour than that one, a method which relied on his audience (or readers) having a clear image of the 'that'. So, looking out at the *Trachelospermum jasminoides* twining round the supports of the loggia outside, I could describe it as like bay in that its leaves are elliptical and evergreen but smaller. The flowers come later than the bay's and are sweetly scented. Theophrastus observed that the leaf is very varied in form, but reasonably constant within a species, and so therefore provided a good basis for

making distinctions. In his lectures, he could hold the one and the other in front of his students. He could make his analogies immediate. Most lanceolate leaves he described as being like laurel. Oblong leaves were compared to the foliage of the olive. For rounded leaves, almost as broad as they were long, the standard was the pear. Hornbeam he described as having leaves 'in shape like a pear's, except that they are much longer, come to a sharp point, are larger, and have many fibres, which branch out like ribs from a large straight one in the middle, and are thick; also the leaves are wrinkled along the fibres and have a finely serrated edge.'⁴ It is a brilliantly vivid description. Was the leaf lying on his desk in front of him as he was writing it? But leaves could not always be depended on as indicators because they were not always the same on the same plant. Ivy confounded him. So did the castor oil plant.

His work, like a series of lecture notes prepared for his classes at the Lyceum, survives in two collected volumes, the *Historia plantarum* and the *De causis plantarum*. They set down the extent of plant knowledge in 300 BC. This is what was known. The quest for order starts here. But unfortunately for Theophrastus, his work was shamelessly plagiarised and regurgitated by the later Roman writer Pliny and it was Pliny's work *Historia naturalis* that was handed down to future generations. As Pliny was quoted and requoted, Theophrastus was forgotten. Knowledge can only be built up from what is known, and tricks of fate – wars, deaths, fires, shifts of power and language – prevented Theophrastus's pre-eminence from emerging until Teodoro of Gaza (c.1398–c.1478) finally turned into Latin the body of knowledge Theophrastus had so painstakingly amassed.

This great gatherer together of knowledge was born at Eresos on Lesbos (Mitylene) in about 372 BC. His father, Melanthus, worked in the cloth trade as a fuller. Theophrastus left Lesbos for Athens to study under Plato at the Academy, one of the greatest of the Athenian philosophical schools. Aristotle was a pupil there too, and when, after Plato's death in 347 BC, Aristotle set up the Peripatetic School at the Lyceum, Theophrastus joined him there. There were only fifteen years between them, but the influence of the older man on the younger showed in everything he wrote. When Aristotle died (he was sixty-three), he left Theophrastus his library, said to be the best that had ever been put together. It included manuscripts of his own works and those of his master, Plato. It provided a solid matrix for Theophrastus's work. Aristotle had already started on his *Historia animalium* before Theophrastus began his similar enquiry into plants. Both were influenced by Plato's theory of ideas, which made an important distinction between the things we see (trees, shrubs, birds, animals, fishes) and the universal forms of which they are an expression. Both Aristotle and Theophrastus were mocked by their contemporaries for spending

time and thought on living things. Theophrastus could (and did) write on politics, ethics, rhetoric, mathematics, astronomy. Why waste your brain on palm trees? And catkins?

Philosophy, though, underpinned his enquiries into plants just as solidly as it did his other work. Theophrastus wasn't writing an encyclopaedia of plants, ranged alphabetically from almond to vine, the essential characteristics neatly annotated to aid identification. He was asking questions about plants. How do you define a plant? Which parts are most useful in choosing a way to classify them? Many difficulties were caused by the assumption that plants corresponded at every level with animals. Could you call the flower or fruit of a plant a part of it? The plant, as it were, gives birth to the flower and the fruit, but you would not call the young of an animal a part of it. And where was the seat of the soul in a plant? It had to have one – inconceivable that it should not – but if a plant could grow from roots, stems, leaves, or seeds (taking cuttings and layering plants were both techniques known to the Greeks), then it would seem that the soul of the plant, its essential beingness, was everywhere in it. But that couldn't be possible. Arguing carefully through various propositions, Theophrastus finally concluded that the soul of a plant lay at the junction of its root and its stem, though that in itself was rather a shady area.⁵ Frequently, he signals the need for more research, as he does in writing about the water chestnut of Egypt. Some said it was an annual, others that the root persists for a long time, new stalks growing from old roots. Theophrastus notes the divergence of opinion: 'This then is matter for enquiry.'

His two works provide a synthesis of the information about plants that was available at the time. Some things he has seen with his own eyes, such as the ability of pine to shoot again from the root after a forest fire. 'This happened in Lesbos [his birthplace], when the pine forest of Pyrrha was burnt.' He notes the knots that often grow on the trunks of apple trees 'like the faces of wild animals'. He writes of the plane tree growing by the watercourse in the Lyceum; while the tree was still young, 'it sent out its roots a distance of thirty-three cubits, having both room and nourishment.' On the other hand, the planes 'which King Dionysius the Elder planted at Rhegium in the park, and which are now in the grounds of the wrestling school and are thought much of, have not been able to attain any size'. Other information (sometimes conflicting) is reported from Mount Ida and Macedonia, Arcadia and Crete. Northern Europe is almost unknown to him. He notes only that iris grow well in Illyria on the shores of the Adriatic and that the people of Panticapaeum in the Pontus find it very difficult to grow the bay and myrtle they need for their religious ceremonies. The winters are too cold. Conversely, the plants of Egypt and Libya get special attention, and Theophrastus gives the first account of cotton, pepper,

cinnamon, myrrh, frankincense and the banyan tree, curiosities reported by Alexander's officers as they made their way through India. He paints a vivid picture of a mangrove swamp, the description brought back by men sailing in Alexander's expedition to the East. They were 'great trees as big as planes or the tallest poplars'. When the tide came up, 'while the other things were entirely buried, the branches of the biggest trees projected and they fastened the stern cables to them, and then when the tide ebbed again, fastened them to the roots'.⁶ He notes the confusion caused by different names being used in different regions to describe the same plant. Sometimes life itself may depend on getting the name right: 'Of the various plants called *strykhnos*,' he writes, 'one is edible and like a cultivated plant, having a berry-like fruit, and there are two others: one induces sleep, the other causes madness . . . The kind which produces madness has a white hollow root about a cubit long. Of this three-twentieths of an ounce in weight is given if the patient is to become merely sportive and to think himself a fine fellow; twice this dose if he is to go mad outright and have delusions; thrice the dose if he is to be permanently insane . . . four times the dose is given if the man is to be killed.' He treats with respect the art of the poisoner.

Stitched through the text is the influence of Plato's belief that by grouping things in their 'natural kinds', philosophers could arrive at an idea of the 'ideal forms' of the natural world. Inherent in this belief was the principle of classification. But you cannot classify until you know what exists. The more examples you have in front of you, the easier it is to see likenesses and differences. Working with too few examples is like playing Pelmanism with too few cards. Nothing matches up. The principle of classification may have come from Plato or Aristotle, but no one before Theophrastus had applied that principle to plants. 'What are the characteristic features that distinguish this plant from others?' he asks. 'What is its essential nature?'

His first difficulty lies in defining the essential parts of a plant, given the prevalent notion that plants corresponded in some way to animals. Nobody had ever done this before. Nobody had grappled with the problem that the parts of a plant are not necessarily permanent, as they are in animals. The transience of blossom, fruit, foliage created a philosophical difficulty. Which parts, he asked himself, belong to all plants alike and which are peculiar to one kind? The differences, he felt, could be separated out into three sorts: one plant may possess parts that another will not; those parts will probably be unlike each other in terms of appearance and size; the parts may be differently arranged (he noted, for instance, how the branches of the silver fir, one of the most important timber trees of ancient Greece, were always arranged opposite each other).

The seminal parts of a plant, he suggested, were the root, stem, branch and twig. Nowhere does he ascribe any importance to the flower. Nor did anyone else working in the field over the next 2,000 years. Mushrooms and truffles troubled him since they had none of these important parts, but since they couldn't be animals, they must necessarily be considered part of the plant kingdom. 'Your plant is a thing various and manifold, and so it is difficult to describe in general terms,' he concluded. There weren't universal characteristics, in the way that a mouth and a stomach were universal to animals. Why did vines have tendrils? Why did oaks have galls? How could these oddities, characteristic of these particular plants, be accommodated in a satisfactory and universal system? And yet he remained convinced that by seeking analogies with the animal kingdom, man could arrive at a better understanding of plants. 'It is by the help of the better known that we must pursue the unknown, and better known are the things which are larger and plainer to our senses.'

Carefully, he proposes dividing plants into four different classes: trees, shrubs, sub-shrubs and herbs. Trees (he gives olive and fig as examples) are distinguished by having a single stem and several branches. They cannot easily be uprooted. Conversely, a shrub, such as Christ's thorn, grows up from the root with many branches. Sub-shrubs such as savory or rue have multiple stems with smaller branches breaking from them. Herbs grow directly from the root with leafy stems. Throughout his work on plants, the first attempt to beat out a way of grouping them into a coherent system, you see Theophrastus testing his propositions to see if they can be universally applied. They rarely can. We still use the four divisions he first proposed, but he immediately recognised a difficulty, for example, with cultivated apples and pomegranates. These were often pruned and trained to grow with several trunks rather than one. They were surely still trees, but they no longer conformed to the most important characteristic that he had laid down to set them apart from shrubs.

So was it possible to classify plants by their size, their comparative robustness or their longevity? Or should distinctions be made between wild and cultivated plants, those that bore fruit and those that didn't, those that had flowers and those that had none? Perhaps a line could be drawn between evergreen plants and those that drop their leaves in autumn. It's a distinction we accept quite easily – yew evergreen, ash deciduous – but Theophrastus, who never ducked from difficulties, knew that in some areas, 'neither vines nor figs lose their leaves'. And he'd heard that in Crete, around Gortyna, there was a plane tree by a spring (it was the tree under which Zeus lay with Europa) that never lost its leaves. Where did these things fit in the *catalogue raisonné*? He was happier with the idea of a natural division between plants that grew on dry land and those that grew in water, perhaps because a similar distinction had already been made between aquatic and land-based

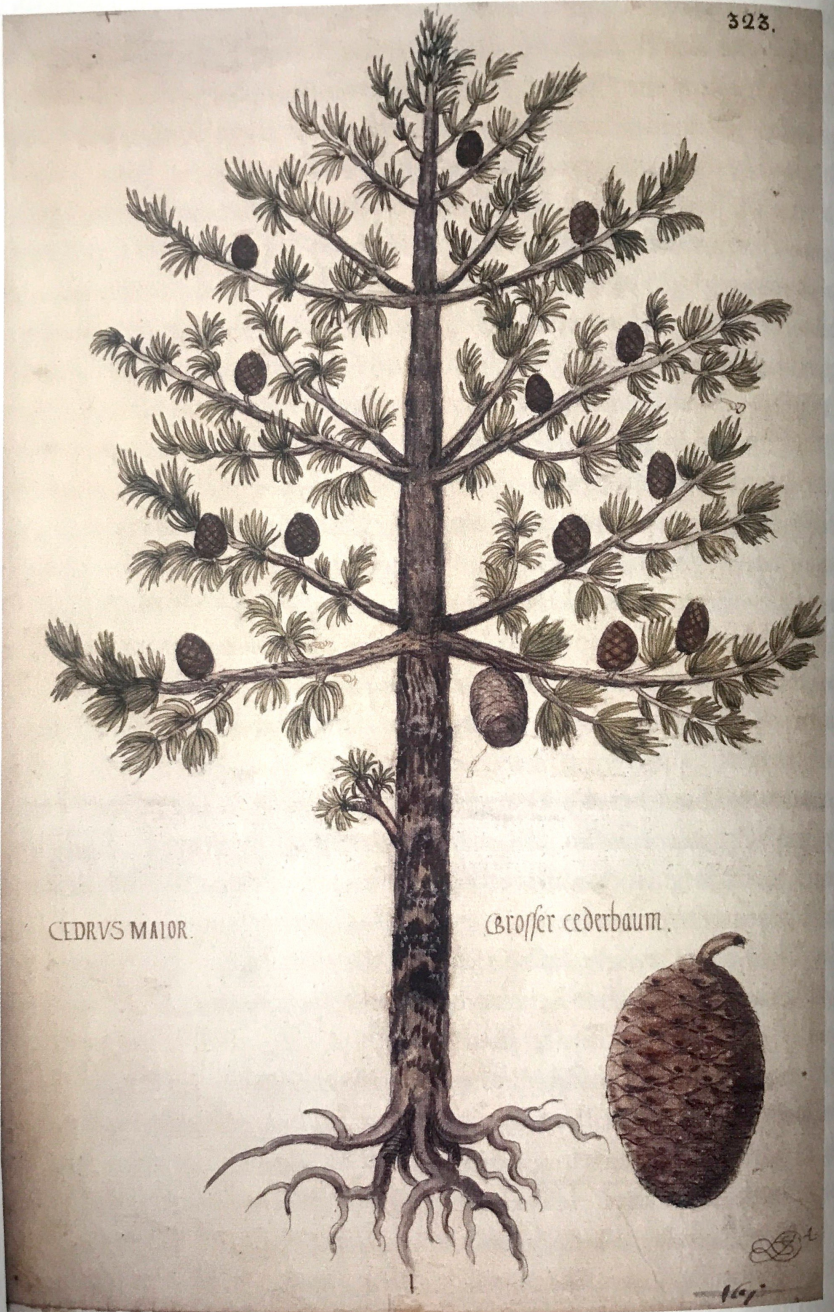


Plate 7: The cedar of Lebanon (*Cedrus libani*) in an illustration prepared for Fuchs's unpublished encyclopaedia of plants. The tree that Theophrastus called cedar ('kedron') is more likely to have been a juniper

animals. Even here though, he foresaw problems. Plants such as tamarisk, willow and alder seemed to him almost amphibious, not particularly concerned whether their roots wandered in earth or in water.

And then, of course, as he pointed out, there were many different kinds of wetness: marsh, lake, river, sea. Theophrastus talked ecology before the word was ever invented.⁷ From the beginning he understood the importance of habitat to plants 'because they are united to the ground and not free from it like animals'. Plants 'peculiar to particular places' must be considered separately. He noted that some mountains produced a special kind of vegetation: the cypress of the Ida hills in Crete; the cedars of Syria and Cilicia; the parts of Syria where the terebinth grew. He understood, even then, that differences in soil and situation give a special character to the plants that grow there. He describes a place called Krane in Arcadia,

a low lying district sheltered from wind, into which they say that the sun never strikes; and in this district the silver firs excel greatly in height and stoutness, though they have not such close grain nor such comely wood . . . Wherefore men do not use these for expensive work, such as doors or other choice articles, but rather for ship building and house building. For excellent rafters, beams and yard arms are made from these, and also masts of great length which are not, however, equally strong; while masts made of trees grown in a sunny place are necessarily short but of closer grain and stronger than the others.⁸

But also, by announcing that he intended to treat plants 'peculiar to particular places' in separate sections of his thesis, he avoided the impossible task of trying to relate the strange, new plants reported from Libya, Persia and India to the better known pantheon of plants in his native Greece. He did not have to struggle to establish the similarities and differences between them.

Trees dominate Theophrastus's *Enquiry into Plants*. Perhaps, given their size and longevity, he considered them more worthy of attention than more ephemeral, lowly plants. And he was deeply interested in function, as it related to form. Those who worked with wood had already accumulated a vast amount of knowledge based on use and experience. For shipbuilding, silver fir, fir and Syrian cedar were the preferred choices. Triremes and longships were made of silver fir because it was light, though the keel of a trireme would be made of oak 'that it may stand the hauling'; lime was chosen for the deck planks of longships. The timbers cut for Demetrius Poliorcetes's ship of eleven banks of oars were thirteen fathoms long. Merchant ships were more usually constructed of fir because it did not decay. In house-building, silver fir was the most useful wood. Lime provided the best wood for boxes and

the manufacture of measures. Kermes oak was preferred for the axles of wheelbarrows and the crossbars of lyres and psalteries. Elm was turned into doors and weasel traps; because it was least likely to warp, elm was also used for hinges, with wood from the root making the cylindrical pivot above and branch wood used for the supporting socket. Holly and Judas tree provided walking sticks; wild olive was the choice for hammers and gimlets. Religious images were most often fashioned from palm wood, which was light, easily worked and soft, but less brittle than cork oak. The best charcoal came from close-grained wood such as holm oak, oak or arbutus. This was the charcoal that was used in the silver mines for the first smelting of the ore. But ordinary blacksmiths generally needed charcoal of fir rather than oak: it was not so strong, but blew up better into a flame and was less inclined to smoulder. All this information, acquired over centuries by builders and carpenters, shipbuilders and foresters, depended on an intimate knowledge of plants. The use to which the various trees were put depended on essential characteristics, the fact that its wood split straight (like silver fir), had a close grain (like boxwood), or could be easily bent (like limewood). But utility alone could not provide a satisfactory way of sorting and organising the plant world (though it later became the standard way of categorising plants among those who were primarily interested in their medical properties). Notwithstanding his deep interest in the various uses to which plants could be put, Theophrastus, rightly, was looking for a way of grouping plants that depended on essential characteristics, not mere function.

He looked at the differences in bark: thin on bay, thick on oak, cracked on vine, almost fleshy on the cork oak. He considered differences in root: long in the plane tree, few in the apple, single in the silver fir, stout in the bay and olive, slender in the vine, absent altogether in the truffle, fragrant in orris, much used in the perfume industry. He considered the form of leaves: broad in the vine and the fig, narrow in olive and myrtle, spiny in fir, fleshy in the houseleek. He noted that some seeds such as the date, the filbert and the almond were packed immediately inside a containing envelope (he was wrong about the almond). In some fruit, such as olive and plum, juicy flesh lay between the outer envelope and the seed. Some seeds (Judas tree, carob) were enclosed in pods. Others such as wheat and millet were wrapped round in husks. Poppy seeds were held in a vessel like a pepper pot. Of flowers, he has very little to say at all. But all these separate parts – roots, leaves, fruit – presented possible ways of sorting and grouping plants. When, after a hiatus of 1,800 years, Theophrastus's work returned to the mainstream, each of these elements was tried out again, now by a succession of plantsmen struggling to find, as Theophrastus had done, a universal system that would fit and codify the multifarious elements of the universe.

After Book I of his *Enquiry*, Theophrastus moves away from the philosophical problems posed by the parts and general character of plants to consider more practical matters. He looks at habits of growth, methods of propagation, noting as all gardeners still note, that 'while all of the trees which are propagated by some kind of slip seem to be alike in their fruits to the original tree, those raised from the fruit, where this method of growing is also possible, are nearly all inferior'. He doesn't know it, but he's talking about clones. Where he is given contradictory evidence, he impartially reports it all, without prejudice. The Arcadians say that the black poplar never bears fruit. The Cretans disagree, citing a number that do, including a specimen growing at the mouth of a cave on Mount Ida 'in which the dedicatory offerings are hung'. In their reports of plants, and in the names they call them, the Arcadians often seem to be at odds with the people of Mount Ida and indeed everybody else. Theophrastus explains the difference between pines and firs as he understands it: 'The fir has many leaves, which are glossy massed together and pendent, while in the pine . . . the leaves are few and drier and stiffer; though in both the leaves are hair-like.' It seems clear enough but 'The Arcadians dispute altogether the nomenclature.' The wood of silver fir is soft and light, that of fir more resinous, heavy, fleshy, more knotted. The ordinary form is much used for painters' boards and writing tablets. But once again, 'The Arcadians appear to differ as to the names which they give.' Painstakingly, Theophrastus picks his way through this muddle of names, collecting synonyms, calmly laying out the facts, highlighting the areas where further enquiry is needed. In the mountains a certain maple is called *zygia*. In the plains, it is *gleinos*. Is this the same tree, under different names, or two different kinds of maple? Local, common names were important (still are) but already, Theophrastus could see an advantage in plants having tags that everybody – Macedonians, Arcadians, Aeolians, Libyans, Cretans – could agree on. Research could then progress on a firm footing.

In his descriptions of plants, Theophrastus uses a wide range of indicators: habit of growth, bark, leaf, the type of wood produced, fruit, root system. He also includes notes on distribution – 'about Mt Ida', 'plentiful in Macedonia' – and habitat. Bird cherry grows where there are rivers and damp places. Elder also grows chiefly by water and in shady places. Box grows most abundantly in cold, rough places such as Cytora, though 'the largest and fairest' are to be found in Corsica, where the tree grows taller and stouter than anywhere else. Sometimes, he makes a family group of plants: three kinds of *mespile* (our medlar, which he throws together with two kinds of thorn), the five oaks recognised by the people of Mount Ida (though others say there are only four . . .). The various kinds of wheat take their names from the places where they grow: Libyan, Pontic, Thracian,

Assyrian, Egyptian, Sicilian. The differences between them are in colour, size, form and their value as food. Varieties may be early or late in cropping, vigorous or weak in growth. The grain may have many coats or few. Some mature more quickly than others.

'The Sicilian', he says, 'is heavier than most of those imported into Hellas, but heavier still than this is the Boeotian; in proof of which it is said that the athletes in Boeotia consume scarcely three pints, while, when they come to Athens, they easily manage five . . . in the country called that of the Pissatoi it is so strong that, if a man eats too much of it, he bursts, which was actually the fate of many of the Macedonians.'⁹ Theophrastus, an enquiring kind of man, accepts that as the truth. There are no qualifying phrases, as there so often are when he includes snippets of folklore. He remarks, for instance, that hornbeam (his *ostrya*) 'is said to be unlucky to bring into a house, since, wherever it is, it is supposed to cause a painful death or painful labour in giving birth'. Though he is respectful towards the rituals associated with religion (the juice of elderberries, he says, 'is like wine in appearance, and in it men bathe their hands and heads when they are being initiated into the mysteries') he is generally scathing about the superstitions that surround various plants, such as cinnamon. 'They say that it grows in deep glens, and that in these there are numerous snakes which have a deadly bite; against these they protect their hands and feet before they go down into the glens, and then, when they have brought up the cinnamon, they divide it into three parts and draw lots for it with the sun; and whatever portion falls to the lot of the sun they leave behind; and they say that, as soon as they leave the spot, they see this take fire. Now this is sheer fable.'¹⁰ He is judicious about customs associated with cutting various herbs – 'That one should be bidden to pray while cutting is not perhaps unreasonable' – but the additions he finds absurd. When cutting allheal, for instance, 'It is said that one should put in the ground in its place an offering made of all kinds of fruits and a cake; and that, when one is cutting gladwyn, one should put in its place to pay for it cakes of meal from spring-sown wheat, and that one should cut it with a two-edged sword, first making a circle round it three times, and that the piece first cut must be held up in the air while the rest is being cut.'¹¹ The inference, perhaps, is that the primary purpose of these rites is to scare away amateur herb-gatherers from plants that the professionals considered their own, lucrative preserve. Allheal, as its name suggests, had powerful properties. The fruit was used to cure disorders of the bladder. The juice healed sprains and strengthened the voice. The root was used by midwives in childbirth, and provided an antidote to flatulence in beasts of burden. It had power against snake bites, and provided a guard against epilepsy. But there were three different plants, the Syrian, the Chaeronean and the Asclepian, which all bore

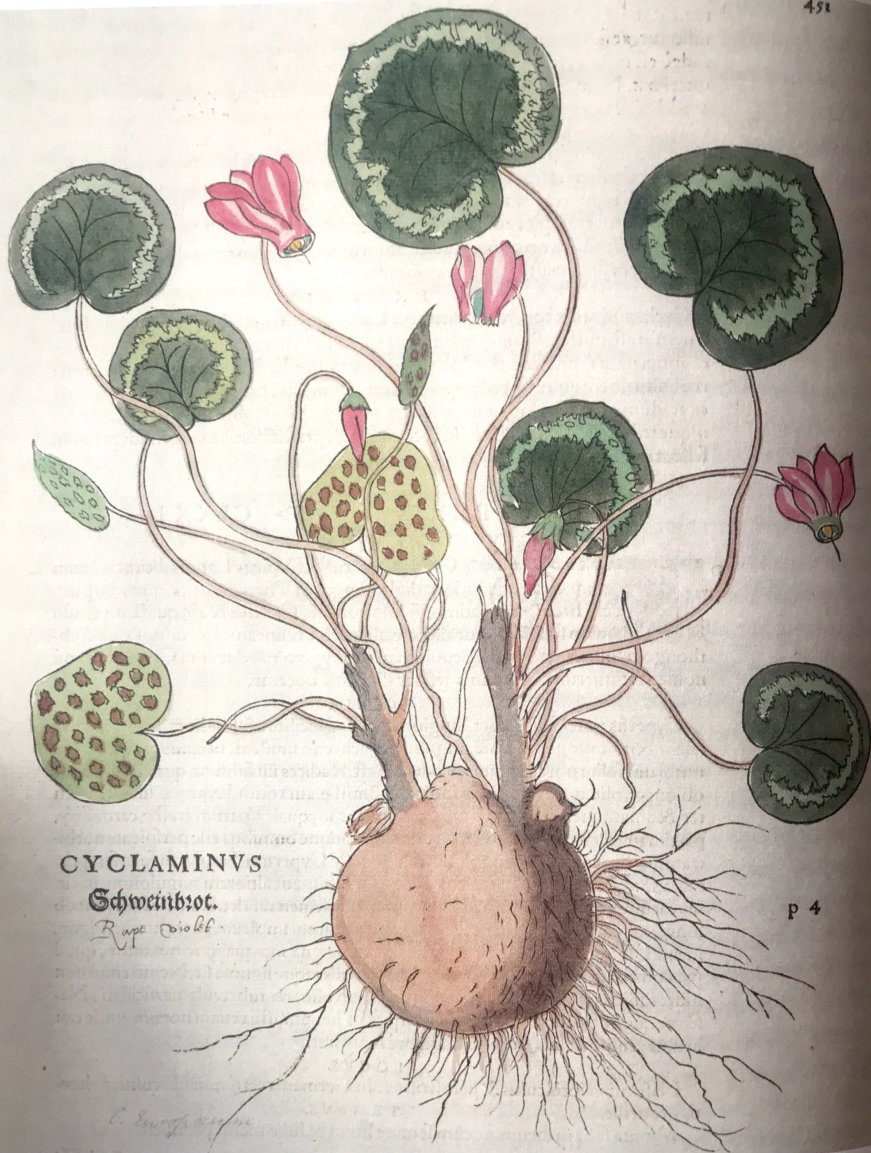
that same common name. You needed to know you had got the right sort. Another lucrative herb was cyclamen, widely used by women in ancient Greece as a diaphragm-like contraceptive; its Greek name, *kyklaminos*, is still the one we use today.

Poisons were of great interest to Theophrastus, as they perhaps needed to be for any prominent Greek. He favoured hemlock, which gave 'an easier and speedier death', over other similar poisons. It was the poison that Socrates had used for his suicidal draught in 399 BC. The plant grows in many places in Europe, including Britain, where it was perhaps introduced by the Romans. With us it favours damp ditches and Theophrastus says that this was where the best plants grew in Greece too. He calls it *koneion* (our *Conium maculatum*), and credits Thrasyas of Mantinea with its discovery. It was he who first

used the juices of hemlock, poppy and other such herbs, so compounded as to make a dose of conveniently small size, weighing only somewhat less than quarter of an ounce. For the effects of this compound there is absolutely no cure, and it will keep any length of time without losing its virtue at all. He used to gather his hemlock, not just anywhere, but at Susa [in Arcadia] or some other cold and shady spot; and so too with the other ingredients; he also used to compound many other poisons, using many ingredients. His pupil Alexias was also clever and no less skilful than his master, being also versed in the science of medicine generally.¹²

In Theophrastus's opinion, the art of poisoning had progressed greatly in modern times. People had learned how repeated use diminished the efficacy of drugs. They now understood that not all poisons would have the same effect on all people. Much more care was given to the preparation of the various different poisons. The people of Ceos, he pointed out, had once just shredded up hemlock, as did most other people. 'Now', he says, 'not one of them would think of shredding it, but they first strip off the outside and take off the husk, since this is what causes the difficulty, as it is not easily assimilated; then they bruise it in the mortar, and, after putting it through a fine sieve, sprinkle it on water and so drink it; and then death is made swift and easy.'¹³

He knew about *nepenthes*, the famous drug said to cure sorrow and passion, inducing forgetfulness and indifference to ills. He had heard that in Ethiopia there was a deadly root with which the Somalis tipped their arrows. And, of course, he was familiar with wolfsbane, his *akoniton*, our *Aconitum anthora*, which grew plentifully in Crete and Zakynthos, but was at its best at Herakleia in Pontus:



CYCLAMINVS

Schweinbröt.

Rape violet.

Plate 8: *Cyclamen* (*Cyclamen hederifolium*) in Cap CLXX of Leonhart Fuchs's *De historia stirpium* (1542). 'Of cyclamen the root is used for suppurating boils,' wrote Theophrastus, 'also as a pessary for women and, mixed with honey, for dressing wounds.'

It has a leaf like chicory, a root like in shape and colour to a prawn, and in this root resides its deadly property, whereas they say that the leaf and the fruit produce no effects . . . it can be so compounded as to prove fatal at a certain moment which may be in two, three or six months, or in a year, or even in two years; and that the longer the time the more painful the death, since the body then wastes away, while, if it acts at once, death is quite painless. And it is said that no antidote which can counteract it has been discovered, like the natural antidotes to other poisonous herbs of which we are told: though the country folk can sometimes save a man with honey and wine and such like things, only, however, occasionally and with difficulty. Wolfsbane . . . is useless to those who do not understand it; in fact it is said that it is not lawful even to have it in one's possession, under pain of death; also that the length of time which it takes to produce its effects depends on the time when it is gathered; for that the time which it takes to kill is equal to that which has elapsed since it was gathered.¹⁴

Writing in about AD 77, the Greek doctor Dioscorides reckoned the best remedy was to swallow a mouse whole. Theophrastus recommends the Medean apple (citron), newly imported from Asia, as a useful antidote. Mixed with wine, it induced nausea and brought up the poison. He explained how it was sown, like date palms, in pots with a hole in the bottom. The object was to produce plants that could more conveniently be exported on long sea journeys.

Theophrastus was intrigued, of course, by the plants that came into Greece as trade opened up with lands to the east and south. He devoted special sections of his *Enquiry* to the plants of Egypt, Libya and the parts of Asia that Alexander's army had conquered. He noted too how 'particular' these plants were to their countries of origin. Often nothing even remotely like these newcomers was known on the Greek mainland. The greater part of Theophrastus's work on plants is concerned with things that grew in his own country and even with these, he struggled to find classes and categories. The more plants that arrived on the scene, the more compelling the task became. European scholars felt the same urgency when confronted with the avalanche of superb plants, many of them bulbs, that came into Europe when trade with Turkey opened up in the sixteenth century. Egypt, whose civilisation was acknowledged to be much more ancient than Greece's own (Mesopotamian art showed cultivated date palms, vines and cereals 3,000 years before Theophrastus began his work in Athens), was of particular interest. The Greeks already had an established trading colony at Naucratis in the Nile Delta by the seventh century BC. From Egypt came the carob and the doum palm, whose fruit produced a very large,

very hard stone. Egyptian craftsmen turned them into wooden rings to hold their embroidered bed hangings.

In great detail Theophrastus describes the lotus, the beautiful Nile water lily which he has never seen for himself. He also gives a long account of papyrus, which he knew as a product, but not as a plant. It grew, he explained,

not in deep water, but only in a depth of about two cubits, and sometimes shallower. The thickness of the root is that of the wrist of a stalwart man, and the length above four cubits; it grows above the ground itself, throwing down slender matted roots into the mud, and producing above the stalks which give it its name 'papyrus'; these are three-cornered and about ten cubits long, having a plume which is useless and weak, and no fruit whatever; and these stalks the plant sends up at many points. They use the roots instead of wood, not only for burning, but also for making a great variety of articles; for the wood is abundant and good. The 'papyrus' itself is useful for many purposes; for they make boats from it, and from the rind they weave sails, mats, a kind of raiment, coverlets, ropes and many other things. Most familiar to foreigners are the papyrus-rolls made of it; but above all the plant also is of very great use in the way of food. For all the natives chew the papyrus both raw, boiled and roasted; they swallow the juice and spit out the quid. Such is the papyrus and such its uses.¹⁵

Papyrus (and date palm) appear on the frescoes at the King's Palace in Knossos (c.1900 BC) and were well known among the Greeks long before Alexander's expedition to Egypt in 331 BC.

This great work of Theophrastus's must have evolved over a long period. Speaking, for example, of frankincense and myrrh, he notes that 'these are about all the facts that have come to our notice at present'. His thesis is to be refined and extended as new information comes to him. He has contacts in Corsica, the Lipari islands, Crete, Boeotia. Most often quoted are the people of Macedonia, Arcadia and Mount Ida. Aristotle had set up the new Peripatetic School at the Lyceum in 335 BC. Theophrastus quickly joined him there and was head of the school by 322 BC. Aristotle's work had a great influence on Theophrastus's *Enquiry*. They had been fellow students at Plato's Academy. When they left the Academy in 347 BC, they travelled together, spending some time in Lesbos, where Theophrastus had been born. Some of Aristotle's earliest observations on marine biology were made on Lesbos, so it is highly likely that Theophrastus was already at work on his own *Enquiry* at this time. A few more clues come from incidents he mentions in the text. Talking about the special reed used for the mouthpiece of the pan pipe (the original pipe



Plate 9: Papyrus, in an illustration originally made for Lobelius's *Adversaria* (1570) and re-used for a 1644 edition of Theophrastus's *Enquiry into Plants*

had a single vibrating reed like a modern clarinet), he notes that the best reeds were cut when the Lake of Orchomenos flooded. 'This is specially remembered to have happened in recent times at the time of the battle of Chaeronea.' That was fought in 338 BC, so the *Enquiry* has to come after the battle. Another pointer comes in his comments about the pomegranates that grow around Soli in Cilicia near the River Pinaris, 'where the battle with Darius was fought'. Darius died in 330 BC. Then, speaking of the trees and shrubs special to Libya, he describes the lotus with fruits as large as a bean. They grow, he says, like myrtle berries, close together on the shoots. 'To eat, that which grows among the people called the Lotus-eaters is sweet, pleasant and harmless, and even good for the stomach . . . The tree is abundant and produces much fruit; thus the army of Ophellas when it was marching in Carthage was fed, they say, on this alone for several days, when the provisions ran short. It is abundant also in the island called the island of the Lotus-eaters; this lies off the mainland at no great distance.'¹⁶ Ophellas was a ruler of Cyrene, the ancient Greek city near the coast in Cyrenaica, North Africa. Some time around 308 BC he invaded Carthaginian territory (near present-day Tunis) with the Sicilian tyrant Agathocles. The date, the latest mentioned in the text, suggests that Theophrastus's work must still have been in progress at that time. By then he was sixty-five, but still had twenty years of work ahead of him.

Then there are the reports of the strange and outlandish plants that Alexander's men had seen in the East. Alexander had set out for India in the summer of 327 BC; by the spring of 326 BC, his admiral, Nearchus, was leading the fleet from the mouth of the Indus (near modern Karachi) along the Beluchistan coast to Hormuz at the entrance to the Persian Gulf. A separate expedition under Androsthene explored Bahrain on the eastern side of the Gulf. Accounts of the voyage, with detailed descriptions of the new plants of these places, previously unknown in the West, were regularly sent back to Athens. What were these puzzling things to be called? How could they be portrayed? The banyan was initially described to Theophrastus as a kind of fig tree, but a very weird one 'which drops its roots from its branches every year . . . these take hold of the earth and make, as it were, a fence about the tree, so that it becomes like a tent, in which men sometimes even live . . . They say that it extends its shade for as much as two furlongs; and the thickness of the stem is in some instances more than sixty paces.' He heard for the first time of 'a cereal called rice' and a tree [we know it as the jackfruit], very large and bearing wonderfully sweet fruit 'used for food by the sages of India who wear no clothes'. Reports came back of another tree 'whose leaf is oblong in shape, like the feathers of the ostrich; this they fasten on to their helmets, and it is about two cubits long'. Is this the first description of a banana palm? He speaks of the plant

from which the Indians make their clothes: it has 'a leaf like the mulberry, but the whole tree resembles the wild rose. They plant them in the plains in rows, wherefore, when seen from a distance, they look like vines.' He is talking about cotton, which, like the banana and the banyan, were then completely unknown in the West. He can only describe them by using more familiar, Greek plants as analogies. The first European settlers in America adopted the same strategy. Any tree that bore acorn-like fruit they describe as an oak. Any plant with a trumpet-like flower is reckoned a lily. Rarely does a plant's own native name travel back with it alongside its description. Theophrastus acknowledges that there are, in India, many plants 'which are different to those found among the Hellenes', but, he says, 'they have no names. There is nothing surprising in the fact that these trees have so special a character; indeed, as some say, there is hardly a single tree or shrub or herbaceous plant . . . like those in Hellas.' Among these newly discovered plants of Arabia, Syria and India, he considered the wide range of aromatics the most exceptional, the most distinct from the plants he already knew.

Theophrastus is hindered by the fact that he does not have the right terms to describe plants in detail. They haven't yet been coined. He separates out some of the most obvious parts – root, stem, branch, leaf. He notes elements such as thorns and tendrils that belong to some plants but not others. He tries out various devices for classifying plants, including a split between flowering and flowerless plants. And yet he does not have the necessary words to describe a flower itself. The petal he considers to be a kind of leaf. Where a flower has prominent stamens, as the rose and lily do, he talks of it as 'twofold', in the sense that one flower (made up of the stamens) sits inside the other. The trumpet flower of bindweed he describes as having only a single 'leaf'. Compared with roots, bark and leaves, the flower was little used in medicine. Since function dictated to such a great extent the amount of attention that was paid to any one plant, nobody showed much regard for those dominated by their flowers. The rose is the only bloom that gets more than a cursory mention. Even by Theophrastus's time, there were many different kinds, differing he says 'in the number of petals, in roughness, in beauty of colour and in sweetness of scent'.¹⁷ Philippi is especially noted for its roses, because the local people gathered them from Mount Pangaeus, where they grew abundantly, and planted them in their gardens.

In one sense, his lack of a technical vocabulary is an advantage. It means that his language is never too specialised, never excludes. And, as with Gerard, 2,000 years later, it encourages the use of colourful simile, as when he likens the dome-like outline of the silver fir to a Boeotian peasant's hat. Part of his problem was that so few plants had been given serious consideration. 'Most of the wild kinds have no

names,' he says. 'Few know about them, while most of the cultivated kinds have received names and they are more commonly observed; I mean such plants as vine, fig, pomegranate, apple, pear, bay, myrtle and so forth; for, as many people make use of them, they are led also to study the differences.'¹⁸ The fig was such an important source of nourishment that slaves' rations of bread were reduced by a fifth when ripe figs were available instead.¹⁹ Of the 500 plants Theophrastus includes in his *Enquiry*, 80 per cent are cultivated.

Analogy was Theophrastus's way. Find the similarities. Observe the differences. But an analogy is not a description. It was certainly within his powers to describe, vividly and to the point. He gives a graphic portrait of the fleshy houseleek cushioned on the tiled roofs of Greek houses. 'Possibly one might mention many other eccentricities,' he says, but then immediately reins himself in again, for 'as has been repeatedly said, we must only observe the peculiarities and differences which one plant has as compared with others'. But analogy can take him only so far. In the end, there had to be more detail in the descriptions before the true analogies could be made.

Theophrastus also had to grapple with the prevailing notion that plants could change from one kind to another. Our system of naming names depends on the idea that a species is a fixed, constant thing. Wheat is wheat. Barley is barley, *Ruta graveolens* is always *Ruta graveolens*. But Theophrastus knew that tadpoles were not always tadpoles. They turned into frogs. Caterpillars went through a similar alchemical process, emerging finally as butterflies. If transmutation was so obviously part of the animal kingdom, it could be true of plants as well. People say, he writes (he often used that phrase, 'people say', or 'some say', when he was reporting matters on which he himself reserved judgment), that both wheat and barley could change into worthless darnel, a weed of cultivated ground, common in cornfields. The farmers of ancient Greece noted that this was most likely to happen in wet weather and in the muddiest parts of their fields. But, like Theophrastus considering the date palm, they did not take this observation in the direction that to us seems logical. They did not assume that the wet weather had rotted their seed corn and that the seed of this unwanted weed had germinated instead. The leaves of darnel, and its way of holding its seeds in clusters either side of the stem, were sufficiently like corn for them to suppose that the one must have degenerated into the other. Some observers thought flax did the same thing. A system, a plan, a structure, a scheme, an order depended on each plant having its own specific tag and not swapping it with another. Theophrastus, uncertain on the matter of darnel, was, though, absolutely sure that wheat did not turn into barley, or barley into wheat, as some people thought. 'These accounts should be taken as fabulous,' he says firmly. 'Anyhow, those things which do change in this manner do so spontaneously, and the alteration is

due to a change of position . . . and not to any particular method of cultivation.²⁰ In this Theophrastus was way ahead of his time. The assumption that plant species were inherently unstable was common right through until the end of the seventeenth century.

In the context of his time, his achievements are extraordinary. In the first sentence of his *Enquiry into Plants*, he writes: 'In considering the distinctive characters of plants and their nature generally one must take into account their parts, their qualities, the ways in which their life originates, and the course which it follows in each case.' Nobody before Theophrastus had even conceived an enquiry of such breadth, let alone produced it. Some of his most seminal thinking centred on the different parts of plants and how they might be defined. We suppose, for instance, that the root of a plant is the bit that is underground. He saw that wasn't true. Plants such as ivy had aerial roots. And, when it is growing, a large part of an onion is underground, but it is not all root. His four basic groups of plants – trees, shrubs, sub-shrubs, herbs (he has to use everyday words, because there are no others – his term for sub-shrub is *phruganon*, meaning firewood or kindling) – provided a useful start, but Theophrastus saw that these could never be rigid categories.

He laid out other distinctions too, not going so far as to suggest them as classifications, merely observing them, letting them lie there. There was a difference not only between plants that grew in water and those that didn't, and between cultivated and wild forms of plants (especially fruit trees), but between deciduous and evergreen trees. Many important cultivated trees were evergreen: olive, palm, sweet bay, myrtle, cypress. Many eyes watched them grow. Habit of growth, leaf fall among evergreen trees, all these things were noted, then recorded in Theophrastus's work. Among deciduous trees, he knows that some, such as almond, leaf up earlier than others, but the first into leaf are not necessarily the first to shed them.

He is the first to recognise, in the 500 plants that he includes in his *Enquiry*, many of the characteristics which eventually helped to determine how plants were to be classified. He notes that some plants are annual, completing the whole of their cycle of growth in a single year; others are perennial, springing up each year from the same rootstock, and dying down to the ground in winter. He sees how some plants seem to fall into natural groups or families, especially those plants which have tiny white flowers arranged in wide flat heads on top of hollow stems. Later, when a more specialised language began to emerge to serve this demanding new discipline, flowerheads of this kind became known as umbels. The term was then used to label all plants that had this characteristic flat head of flowers – the *Umbelliferae*: angelica, carrot, celery, dill, fennel, parsley, parsnip, cow parsley, hogweed, Queen Anne's lace, sweet cicely, alexanders, ground elder. And the deadly poisonous hemlock.

There was a clear and pressing incentive to understand the difference between this plant and its similar wild cousins.

Theophrastus uses the popular names of plants, where they have them, because there weren't any others. Many wild plants, he writes, have no names at all; he is the first person to suggest that, as these things are all part of man's landscape, they should be recognised and described. In treating animals, Aristotle, after all, had said, 'We will not leave out any of them, be it never so mean.'²¹ Plants deserved the same close attention, the same embracing strategy. Theophrastus often uses the popular name to label the plant he thinks most typical of its kind. Then he adds describing words to distinguish other similar kinds of that particular plant. In speaking of oaks, he describes one that is broad-leaved, another that is straight-barked, a third called the Turkey oak and also the gall oak, which produces the growths that tanners used to prepare their leather hides. We use popular names in the same way to distinguish between different kinds of the same, basic prototype: spreading hedge-parsley, knotted hedge-parsley, upright hedge-parsley. The system works reasonably well while the whole business of plant names remains a parochial affair. Problems arise when one man's hedge-parsley becomes another man's hogweed. Even Theophrastus noted that the way the Arcadians distinguished between plants, for instance, was not a way that Macedonians or Aeolians understood. The confusion over popular names increased dramatically as later, in the Renaissance, knowledge began to travel between Italy and France, Germany and England.

When Theophrastus died, in 287 BC, he bequeathed his garden, its walks, and the adjoining houses to his friends, Callio, Callisthenes, Clearchus, Demotimus, Hipparchus, Neleus, Strato, 'and to those that will spend their time with them in learning and philosophy'. There were conditions attached: nobody should claim as their own any part of the houses or their grounds, or 'alienate them from their proper use'. The place should be enjoyed in common by them all; they should look upon it as somewhere they 'may familiarly visit one another and discourse together like good friends'. Theophrastus asked to be buried in his garden, wherever his friends thought most suitable. He did not want them to spend extravagant amounts either on his funeral or on his tombstone. He asked that his overseer, Pomphylus, should continue to live in the house, and take care of everything, including the slaves who worked in Theophrastus's garden. He called them his 'boys'²² and asked that after his death, three of them, Molo, Cymo and Parmeno, should be set free. 'As for Manes and Callias,' he says, 'I will not have them given their freedom until they shall have laboured four years longer in the garden, so that there be no fault found with their labour and diligence.' After that, they too were to have their freedom. He mentions two other slaves: one, Cano, was to be given to Theophrastus's friend.

Demotimus; the other, Donax, was to go to Neleus.²³ In a life that lasted for eighty-five years, Theophrastus's great work on plants represents only 5 per cent of his output. At the end, in a sentence perhaps too neatly epigrammatic to be real, he said, 'We die just when we are beginning to live.' But you search Athens in vain for a memorial to this great man. At the spanking new Natural History Museum in Kifissia – nothing. Amongst the statues that crowd squares and piazzas – nothing. The botanical museum in Athens's Central Park, the National Garden, is firmly closed. Weeds grow in the pantiled roof and around the fine marble columns. There is an abandoned rill edged with stone. A few scraggy roses surrounded by chickweed and dandelion grow under the tall pines that throw their shadows on the diagonal pantiles of the museum's façade. Wild barley grass waves in the wind under an old Judas tree smothered in ivy. 'I'm looking for Theophrastus,' I say to a gardener close by, who is sporadically sweeping leaves to the accompaniment of Abba's 'Dancing Queen' on his radio. 'Is it a shop?' he asks. So think of him when you look at the bronze, thrusting shoots of paeony breaking through the ground in spring. His name *paeonia* is the one we still use. He is with you too as you bend to catch the spicy scent of narcissus, or *narkissos*, as he wrote it. *Aspharagos*, *elleboros*, *skilla*, *anemone*, *iris*, *krokos* are all in his book. Remember him.



Plate 10: The date palm, as shown in Descriptions of Some Indian Plants (1600–1625)