An old multi-stemmed specimen of *Heptacodium miconioides* growing in woodland on Tian Tai Shan, Zhejiang, September 2004, probably the first wild plant of *Heptacodium* to be seen by a Western botanist since its discovery by Ernest Wilson in 1907.

Heptacodium miconioides Rehder

In his last 'Tree of the Year', JOHN GRIMSHAW discusses what distinguishes a shrub from a tree and writes about a large shrub introduced to cultivation first in the early twentieth century and again in the late twentieth century, that is rare in the wild.

Introduction

When the terms of reference for *New Trees* were drawn up (see pp. 1-2), having agreed that the book would contain only trees, we had to address the deceptive question 'what is a tree?' Most of us 'can recognise a tree when we see one' and in many ways this is as good an answer as one needs, but when is a woody plant not a tree? When it's a shrub, of course–but what is a shrub?

In the end we adopted the simple definitions that a tree 'normally [has] a single stem reaching or exceeding 5 m in height, at least in its native habitat. A shrub would normally have multiple woody stems emerging from the base or close to the ground, and would seldom exceed 5 m in height' (Grimshaw & Bayton 2009). In most cases this served to make a clear distinction, but one of the casualties that fell between the two stools was the Chinese plant *Heptacodium miconioides*, a significant recent introduction described by the *Flora of China* (Yang *et al*. 2011) as a 'shrub or small tree'. The question of whether it should have been included or not has 'bothered' me for years, so this article serves to provide the full coverage that *Heptacodium* deserves, and to address the nature of 'shrubs' and 'trees'.

The nature of woody plants

Nursery catalogues, and reference works on woody plants such as *The Hillier Manual of Trees and Shrubs* (Hillier & Coombes 2002), often divide their subject into categories. In the case of the *Hillier Manual*, these are 'Trees and Shrubs' (i.e. broad-leaved taxa), 'Climbers', 'Conifers' and 'Bamboos'. These are very handy for breaking up a catalogue as they are all apparently distinct groups–or are they? How about palms and the so-called 'woody lilies'? And what on earth is a subshrub?

Woodiness

Perhaps it is best to start with the subject of wood, and woodiness. Plant cells are effectively little boxes containing the cellular organs (nucleus, chloroplasts, etc) within walls made primarily of cellulose, a complex chain of linked glucose molecules that is very strong, but also comparatively porous (enabling water and nutrients to pass from cell to cell). In these pores another complex molecule, lignin, may be deposited; unlike cellulose and other components of cell walls, lignin is impermeable to water and as such it is essential in creating water-bearing vessels, the xylem, within the plant, but its strength also gives structural rigidity. The degree to which lignin forms in a plant will determine

the hardness of its wood.

Lignin (a term derived from Latin, *lignum*, wood) is found in all vascular plants and also in the aquatic red algae, but is absent from fungi, green and brown algae, and bryophytes (mosses and liverworts). In consequence these can never achieve great height (on land) or rigidity, and their capacity to transport water is also limited. The tallest moss, *Dawsonia superba*, from damp habitats in Australasia, only reaches 50 cm.

In vascular plants, from the primitive spore-bearing clubmosses and ferns, through the gymnosperms to the various groups of flowering plants, there is a system of lignified water-conducting vessels that enables water to travel effectively from the roots throughout the plant, even to the top of the tallest trees. The degree to which lignification occurs will determine the woodiness of the plant in all of these groups. (It is probably worth mentioning here that our usage of the term 'woody plant' usually refers to those with perennial stems, but anyone who has cut down a border of herbaceous perennials will be aware that the stems of some of these can be distinctly woody, and indeed the boundary between 'herbaceous' and 'woody' is itself very blurred, especially in the tropics.)

Our standard 'catalogue categories' of woody plants do not all have the same sort of woodiness, however. A plant's vascular system consists of two sets of 'pipes', the phloem, on the outer side of the stem, principally carrying nutrients, and the xylem, which is the main water-carrying vascular system, forming an inner layer. They are separated by an active layer, the cambium, from which these cells are differentiated. Each year, as growth occurs, the growing point produces phloem and primary xylem, to continue the 'piping' up and through the plant and thus forming a continuous tube. However, in gymnosperms (conifers and relatives) and most angiosperms (flowering plants) the phenomenon known as secondary thickening occurs, in which a ring of secondary xylem continues to be produced from the cambium. This is how the stem increases in girth each year, and the effect is clearly visible in temperate trees as growth rings marking the annual increment of wood. Each ring is the secondary xylem formed during that growing season. Structurally, it varies, with gymnosperms producing more or less undifferentiated secondary xylem, whereas the density of secondary xylem may vary in angiosperms. This new material will become lignified to varying degree and become wood, again with its hardness depending on the degree of lignin deposited.

Not all woody plants have secondary thickening, however. Of our 'catalogue categories' three groups are noteworthy. In tree-ferns, the stem is effectively an erect rhizome and although growth proceeds in the normal way at the tip through the production of primary xylem, there is no secondary thickening and any increase in diameter with age is due to the aerial roots produced by the stem. Similarly, palms, bamboos and other monocots produce only primary xylem and, once formed, their stem never increases in diameter,

giving the cylindrical trunks of palms, and the tapering culms of bamboo. If, however, in the life of a palm, there is a particularly lean period, the trunk may show a constriction where growth from the terminal point was reduced for a few years; as it recovers (for example after transplantation) the meristem resumes vigour and the cylindrical growth continues. In both palms and tree-ferns basal branching occurs in some species to create a clump. The rhizomes of a bamboo are its true stems, with the culms being perennial, woody shoots from them.

So members of all these groups become woody by slightly differing means, with consequences for their morphology.

Shrub vs. tree

The Concise Oxford Dictionary says that a shrub is "a woody plant smaller than a tree and usually divided into separate stems from near the ground", while a tree is a 'perennial plant with single woody self-supporting stem or trunk usually unbranched (cf. shrub) for some distance above the ground.' These are very similar to the descriptions found in botanical glossaries (e.g. Hickey & King 2000), suggesting that everyone knows what they're talking about. In the discussion below it should be assumed that a naturally grown specimen is under consideration, rather than one shaped or pruned in any way by human or other agencies such as wind: the wind-stunted oak on a cliff-top with a leader nipped by rabbits at an early age does not count, even though it may be definably 'shrubby'. Some plant scientists use a system of describing plant growth-forms developed by a Danish botanist Christen C. Raunkiær (1907), which uses the position of the buds in relation to the ground to classify plants into categories: unfortunately shrubs and trees are classified together (as 'phanerophytes') in this system, so it doesn't elucidate much. Numerous scholarly works have attempted to deal with plant architecture, whether from empirical observation or computer modelling, but it is not an easy subject to tackle (Tomlinson 1987). Particularly influential has been the work of Francis Hallé and colleagues (Hallé *et al*. 1978, Hallé 2004), who have produced descriptions and diagrams illustrating a series of 'model' growth forms of tropical trees, each model being named after a botanist who has worked on plant architecture. These can be very helpful in succinctly describing the appearance of a tree, but are of less use in the tangle of forms represented by that simple word 'shrub'.

Plant growth form is about resource capture, which in the case of above-ground parts, means capturing light and the placing of flowers in an advantageous position for pollination (root architecture is also complex, but out of sight and usually out of mind). The precise architecture of this happens varies, however, by genus and species, each taxon having evolved individually. *Cornus*, for example, has an exceptionally wide range of growth forms ranging from single-stemmed, indubitable trees such as *C. controversa*,

C. florida, *C. kousa* or *C. walteri*, to bushier species such as *C. capitata* or *C. mas*, in which some stems become of tree-like stature, while in *C. alternifolia* stems produced from the base, pushing up through lower, earlier growth, can succeed in forming a single, tree-like stem. Then there are shrubby species like *C. alba* or *C. amomum*, growing from a central point, with their branches arching out and rooting at their tips to form a tangled thicket: *C. sericea* is similar, but in this species and in *C. sanguinea* underground stolons are produced that produce shoots away from the parent plant. The ultimate expression of this is in the Dwarf Cornels, *Cornus canadensis* and *C. suecica*, effectively dwarf herbaceous plants producing annual shoots from long underground stems. The diversity seen in this one genus illustrates just how difficult it is to say exactly what a shrub is.

'Subshrub' is an even more imprecise term, used to describe small woody plants such as *Helianthemum* or *Thymus* with a fine woody structure, but which are (subjectively) regarded as being too small to be a 'proper' shrub. In the Raunkiær life-forms classification they would be termed chamaephytes, whose buds should be held no more than 25 cm above the ground.

Most temperate climbing plants fit the definition of a shrub by branching from the base, but the stems ascend other plants, placing their vegetative and floral parts advantageously into sunshine. This is achieved by various means, including modified roots (e.g. *Campsis*, *Hedera*); tendrils (e.g. *Passiflora*, *Vitis*); the twisting of petioles (e.g. *Clematis*); or the twining of the stem around a support though differential growth of the cambial meristem (*Actinidia*, *Lonicera*, *Wisteria*). Others clamber up without actually 'holding on', producing long stems that weave through branches that support them. Such plants are described as 'scandent': horticulturally familiar species include *Jasmimum nudiflorum* and *Solanum crispum*. Climbing roses are usually scandent in principle, but their thorns grapple the support and assist in keeping the plant upright. In *Rosa*, and genera such as *Jasminum* and *Lonicera* the progression of growth form from shrub to climber can easily be observed.

Most conifers are single-stemmed in their normal wild state, though in some wild variants and many cultivated selections, there is no strict apical dominance and the plants branch from low down to form a mounded shrub. Some smaller members of the Podocarpaceae are also shrubby in this fashion. The temperate gymnosperm genus *Ephedra* (Ephedraceae) can be stoloniferous and scandent, forming shrubby masses of varying size, while in the tropics *Gnetum* (Gnetaceae) may be a large liane or a tree.

Perhaps the most important factor differentiating the large woody plants we call trees from shrubs is the strength of the apical dominance found in trees, resulting in strong upright growth of the principal stem. Apical dominance is the force exerted on the plant's growth by a hormone, auxin, produced by the growing point that percolates down through the plant and suppresses the development of side branches. As its effect attenuates, side branches

can develop, and as most gardeners know by practice, the removal of the tip of a shoot (thereby removing the source of auxin) causes the plant to break buds lower down the shoot and become bushier. Dendrologists, however, frequently want to ensure the survival of the 'leader' to enable a tree to develop a good straight stem. Side branches are also governed by the auxin produced at their tip, with smaller quantities produced by each subsequent branchlet. The loss of the leader, or other higher order growing points, will, however, enable lower buds to develop apical dominance and the plant can thereby recapture its natural shape. The strong regrowth seen after coppicing some trees is the familiar expression of this.

It is the intermediate state, where a woody plant produces numerous shoots from the base, of which some can become dominant and achieve tree-like girth and height, that causes terminological difficulties. Among such plants is *Heptacodium miconioides*.

Family Caprifoliaceae
Heptacodium Rehder
One species: description below

Heptacodium miconioides Rehder
(Syn. *H. jasminoides* Airy Shaw)

A large deciduous shrub, 7-9 m, with arching branches that are weakly quadrangular when young. Bark reddish-brown when young, becoming pale and somewhat shaggy with age, peeling in long strips; shoots slightly pubescent when young. Leaves opposite, entire, lacking stipules; petiole short, 10-15 mm, reddish, with red warts and some hairs; lamina ovate to oblong-ovate, 8-15 × 5-9 cm, leathery, opening pale green and sparsely hairy, becoming dark green and more or less glabrous above, with a few hairs on the main veins, with three conspicuous veins from the base, veins prominent and sparsely pubescent below, base obtuse to subcordate, apex acuminate to long acuminate. Inflorescence a terminal panicle composed of numerous small clusters (capitula) of fragrant flowers. Each capitulum is formed of a sessile whorl of two opposite 3-flowered cymes and a terminal bud, with 2 pairs of involucral decussate bracts and 12 bracts. Involucral bracts ovate and persistent in fruit, glabrous to sericeous, becoming longer and covering bracts and ovaries. Sepals 5, 2-2.5 mm, equal to ovary in length at flowering (when pale green), slightly protruding from involucre, but expanding to 7-10 mm after flowering, when often strongly tinged red. Corolla 10-15 mm long, *c.*16 mm across, tubular-funnelform; white, with a faint greenish flush externally, tube strongly curved at base and slightly swollen with a nectary inside, lobes 5, 7 mm, regular, slightly downcurved, densely adpressed-hairy. Stamens 5, inserted between the corolla lobes, exserted; filaments inserted at middle of corolla tube, hairy, free only in uppermost portion; anthers cream, becoming

photograph © John Grimshaw

Heptacodium miconioides growing at the Arnold Arboretum.

brown. Ovary 3-locular, 2 locules with numerous sterile ovules, remaining locule with 1 fertile ovule. Style 7 mm, hairy except at base, stigma pale green, discoid. Fruit a leathery achene, 10-11 mm, cylindrical, silky-hairy crowned with a persistent and enlarged calyx, red on sunny side, containing one seed 5-6 mm long (Coombes 1990, Yang *et al*. 2011).

Distribution CHINA: Anhui, Hubei, Zhejiang. **Habitat** scrub, woodlands and at the edge of broadleaved evergreen forests, often on cliffs, 600-1000 m **USDA Hardiness Zone** 5(-4). **RHS Hardiness Rating** H6. **IUCN Conservation Status** Vulnerable

Introduction to cultivation

Heptacodium was discovered by Ernest Wilson in western Hubei in 1907, growing on cliffs at Hsing-shan Hsien, presumably on today's Xingshan. Wilson collected it in flower and fruit, in July and October respectively (under *Wilson* 2232), but Rehder's note to the formal description of both genus and species, published in 1916, explains why it was not introduced at that time: 'only a single fruit was available for examination'. Rehder derived the generic name from the Greek έπτά (hepta) for seven, and κώδειά (codeia), a poppy-head in reference to the unusual arrangement of (apparently) seven flowers in each cluster. The specific epithet refers to the plant's superficial similarity to the genus *Miconia* (Melastomataceae), which also has large, strongly veined leaves and small white flowers. Its Chinese name means 'Seven-son flower

photograph © Anne Rieber

The flowers of *Heptacodium* are arranged in whorls of (usually) six, with the bud of the expanding inflorescence axis appearing to be another flower bud in the centre.

photograph © Tim Alderton

The expanded red calyces of *Heptacodium miconioides* after the flowers have dropped, on a specimen at the J C Raulston Arboretum in North Carolina, September 2006.

of Zhejiang' and Seven-son Flower has become widely adopted as an English name for the species.

Seven is actually misleading, for the flowers in each capitulum are held in two rows of three clustered around a central bud, which is not a flower bud but in fact a continuation of the inflorescence axis, which will push up as the flowers fade and develop a new ring of six flowers, again round a central bud. Three such iterations have been observed (Coombes 1990).

Its distinctive morphology and unique chromosome number of 2n = 28 (Zhang *et al*. 2002) has resulted in its affiliations within the Caprifoliaceae being debated (see e.g. Pyck & Smets 2000), but recent phylogenetic analyses suggest that it is most closely related to *Lonicera* and its group of related genera (*Leycesteria*, *Triosteum*, *Symphoricarpos*) (Jacobs *et al*. 2009, 2011).

For at least the past century, *Heptacodium* has been a rare plant: Wilson noted it to be 'very rare' on the Xingshan (Rehder 1916) and the World Conservation Monitoring Centre (1998) notes that it has not been found recently there, its westernmost point of distribution. In China it is under second class national protection, and is now known from only nine small, populations that are physically and genetically isolated from each other, and suffering from uncontrolled vegetation clearance (Lu *et al*. 2006). There can be little doubt that it is far more abundant in cultivation than in the wild, though the genetic diversity of cultivated material is limited, as almost all is derived from one source.

In 1980, after 30 years of closure to the West, China admitted a party of American hortico-botanists, who in collaboration with Chinese colleagues called themselves the Sino-American Botanical Expedition. This remains one of the most significant collecting expeditions in recent years, with numerous

photograph © John Grimshaw

A multi-stemmed, shrubby specimen of *Heptacodium* at the Savill Garden, August 2011.

good plants, including the beautiful *Liquidambar acalycina* and the whitebeams *Aria* (*Sorbus*) *hemsleyi* and *A. yuana*, owing their introduction or reintroduction to it (Grimshaw & Bayton 2009). The expedition concentrated its collection in the wild in the Shennongjia Forest District of Hubei, but also visited Chinese botanical gardens. At Hangzhou Botanical Garden the party was shown a specimen of *Heptacodium* and were granted permission to collect seed from it, which Theodore (Ted) Dudley of the United States National Arboretum (USNA) and Stephen Spongberg (Arnold Arboretum) did, 'avidly and voraciously' (Koller 1986). This specimen had been transplanted from a wild population in the Zhejiang Province Preserve, which was the type location for *H. jasminoides* Airy Shaw, described in 1952, and in consequence the SABE material from Hangzhou was grown as *H. jasminoides* for several years until it was realised that this was conspecific with Wilson's discovery and the name *H. miconioides* was reinstated (Spongberg 1990).

The seed brought back to the United States in 1980 was not included among the numbered SABE collections, but was regarded as 'supplemental', with the two collectors using their own numbering sequence, to result in the batch SAS 10 going to the Arnold Arboretum, and TRD 10A going to USNA (Dosmann & Del Tredici 2003). These numbers have seldom been used since, with Gary L. Koller (1986), the early historian of the species' introduction, using only the accession numbers for each institution: AA 1549-80, and NA49226 respectively. The plants raised from this gathering are the principal source of the species in cultivation see below), but in 1981 *Heptacodium* seed was

photograph © Wolfgang Bopp

Peeling bark at the base of the oldest specimen of *Heptacodium* in the Sir Harold Hillier Gardens, received as seed from Hangzhou in 1981.

included in the Hangzhou Botanical Garden *Index Seminum* and some was received by the Arnold Arboretum (AA 403-81). Seedlings were raised at the Arnold Arboretum from this accession, though none remain there now. Seed from this distribution was received at the Sir Harold Hillier Gardens in Hampshire and constitutes the first introduction to the United Kingdom: three specimens remain from this accession. As Koller (1986) points out, it is possible that other botanical gardens also received material from this source, though he was unable to locate any.

The Sir Harold Hillier Gardens also have a specimen raised from seed received in 1993 from the Shanghai Botanical Garden, offered in their 1992 *Index Seminum*. The information recorded in their database is that it was collected on Emei Shan, but Dr Hu Yonghong of the Shanghai Botanical Garden (pers. comm. via Allen Coombes 2013) has informed us that it actually came from Dapan Mountain Resort, Zhejiang, as a seed collection made in 1992. This plant therefore uniquely represents a different population and is of great genetic importance.

From the original importation, 11 plants were raised at the US National Arboretum and were planted out in China Valley (Koller 1986), where they remain as large multi-stemmed plants (R. Olsen, pers. comm. 2013), while at the Arnold Arboretum six seedlings were successfully raised (Koller 1986). Five survive and form a row of beautiful big, broad multi-stemmed shrubs, which I was able to enjoy in full flower in September 2011. They now stand at 8-9 m tall (P. Del Tredici, M. Dosmann pers. comms. 2013). It is from these, and the now-disappeared 1981 plants, that the vast majority of cultivated *Heptacodium* has been derived. Distribution started early: Koller records that J. C. Raulston of the North Carolina State University had received cuttings from the Arnold Arboretum in 1983 and by 1986 had given one to the US National Arboretum. By 1986, indeed, Raulston was predicting that it would be a successful commercial plant in the United States, and promised that in 1987 the NCSU Arboretum would have 'good quantities for distribution' (Raulston 1986). He was pre-empted in 1986, however, by the Arnold's own special offer to its members of two rooted cuttings for $30 (Koller 1986).

The USNA, meanwhile, had also distributed material, with three

original seedlings being sent to the University of British Columbia Botanical Garden in Vancouver in 1983, and five were being grown by the Darthuizer nursery, Leersum, The Netherlands by 1985. By 1986 Koller could report that material had been distributed from the Arnold throughout the United States, Canada and Europe (including the Royal Botanic Gardens of Kew and Edinburgh). 'Spongebag' introductions also reached the UK during the 1980s (Keen 2004).

The first seedlings from both the 1980 and 1981 seed flowered first in 1985, in Vancouver as well as on the East Coast, and large quantities of seed were collected at the Arnold Arboretum (at least) making it possible to experiment with germination techniques as well as hastening the plant's distribution in cultivation (Koller 1986). In Britain it first flowered at the Hillier Gardens in 1987, having been planted out earlier that year (Coombes 1990). It can now be said to be a commonly grown plant across North America and Europe, and freely available in the nursery trade on both continents. Peter Del Tredici and Li Jianhua of the Arnold Arboretum found plants growing in the Tientai Shan, Zhejiang, in 2004, but did not collect material (P. Del Tredici, pers. comm. 2013). I have been unable to trace any other records of western botanists seeing *Heptacodium* in the wild.

Heptacodium in horticulture

As discussed above, the Seven-son Flower soon made its mark in gardens, rapidly becoming valued for several good qualities (e.g. Coombes 1990, Lancaster 2001) and, after 30 years of observation, it was adjudged worthy of the Royal Horticultural Society's Award of Garden Merit in 2012.

In full growth the plant is very distinctive, with pendulous dark green leaves, often somewhat in-rolled to show paler undersides. With their conspicuous venation they are rather handsome, but they do not turn any significant colour in autumn, yellowish being the best they can manage and in many cases they fall late without colouring. The flowers appear in late summer, usually being at their best in August and September, but they can persist well into autumn, to be finished off by the first frosts. In warm areas they will be earlier than in colder sites: a specimen regularly observed (from the car) in a front garden in Welburn, North Yorkshire, in the cool late summer and autumn of 2012, did not manage to open flowers until October. Anne Rieber (pers. comm. 2012) reports a very similar situation in Norway, where although plants survive the cold winters, they flower best when the autumn is warm and sunny as it was in 2006, when they flowered freely in October. Growth is also slow in cooler climates: Norwegian specimens have reached only 3 m, despite being planted in the mid- 1990s.

The flowers are individually small, but it is free-flowering (on new growth) and within the inflorescence individual capitula, with their 3+3+1 arrangement, are worth close inspection. They're also pleasantly fragrant, being reminiscent

of its relative *Lonicera*, and, according to the gardening journalist Mary Keen (2004), are as attractive to butterflies as *Buddleja*. After flowering, especially in a warm dry autumn, the enlarged calyx becomes tinged with red to varying extent. These can be a colourful feature in their own right; 'The effect of all the tiers of these exotic fruits with seven splendid purple crowns is spectacular' (Tripp & Raulston 1995). In consequence it is a very useful late-flowering shrub, though it does need space to achieve full stature. As mentioned above, the original plants at the Arnold Arboretum are big bushy specimens up to 9 m tall, and at the Hillier Gardens the oldest specimen, grown from seed received in 1981, has reached 8 m (Sir Harold Hillier Gardens Database 2013). It may therefore be too large, if left unmanaged, for small gardens, but with judicious pruning it could certainly be kept within bounds. It is probably best as a background planting for smaller shrubs, but consideration should be given to ensuring that the pale stems can be seen and appreciated in winter.

Such guidance as is available (e.g. Dirr 2009) suggests that it does best in 'moist, well-drained, acid, organic laden soils'–but away from such utopian conditions it seems to do alright too, including on limestone-derived soil. It should not get too dry and desiccated in summer and in very hot places light shade will help, and it may need supplementary watering in such conditions (Dirr 2009). It is extremely hardy, growing well across most of North America, and Dirr reports only slight tip dieback at -30 °C (-22 to -24 °F), making it hardy in Zone 4, though usually rated Zone 5 on the USDA scale. Using the new (2012) RHS Hardiness Ratings, which look at plant survival rather than the climate, it can be given a rating of 6, as it is hardy throughout the UK and northern Europe, though not in the most exposed locations.

Heptacodium is reasonably easily propagated from seed, with early observations at the Arnold Arboretum in the 1980s suggesting that it will germinate best after a period of five months at 18 °C (65 °F) followed by three months cold, at just above freezing point, but with later experimentation suggesting that consistently mild temperatures, without a chilling period at any time, gave the best results (Koller 1986). Propagation is usually effected by cuttings, with softwood or semi-ripe material rooting easily in late spring or early summer, under mist or high humidity, with hormone treatment, but late summer firm cuttings are not very successful (Dirr 2009). Fortunately, *Heptacodium* has shown no signs of being invasive in any part of the United States (P. Del Tredici, pers. comm. 2013).

Shrub or tree?

So is *Heptacodium* a shrub or a tree? As a young plant, left to grow naturally, it is an indubitable shrub, producing several stems from the base, with successive shoots overtopping their precursors as is seen in many other familiar genera of the Caprifoliaceae (e.g. *Abelia*, *Kolkwitzia*, *Lonicera*, *Weigela*). As the plant ages the oldest growth is shaded out and the principal stems become woodier and

One of the original seedlings of *Heptacodium miconioides* at the Arnold Arboretum, clearly showing its natural multi-stemmed character – and the attractive pale bark, a useful winter feature.

thicker, with fewer vigorous basal shoots pushing through the plant. Growth now mostly occurs from the upper part of the plant, either as comparatively weak shoots at the branch tips, or from the upper surface of arching branches where a bud breaks and develops a degree of apical dominance. By this means a strong woody framework can be built up–if not removed by gardeners exhorted to prune-out old wood. Old plants of *Kolkwitzia*, for example often have a single strong main stem from which a canopy of growth develops. This

Heptacodium grown at Mount Auburn Cemetery, Massachusetts, as a single-stemmed tree.

is particularly the case where the plant has been surrounded by other vegetation forcing the main stem upwards while shade has suppressed basal growth.

All this is true for *Heptacodium*, but in this genus there does seem to be a strong tendency towards apical dominance in the more vigorous shoots, and these will continue to grow upwards to give a straight stem. It is this that gives the opportunity for gardeners to prune their plants to encourage the development of a single stem and thus grow *Heptacodium* as a single-stemmed tree. This is indeed a very attractive way of growing the species, as the image of the tree in Mt Auburn Cemetery shows, enabling the pale peeling bark to show to best advantage in winter, and permitting other plants to be grown closer to the base of the specimen. It is not, however, the natural growth habit of the plant. Peter Del Tredici's unique photograph of a massive wild plant (see p. 25) shows clearly that, although it has big thick trunks reaching up to the canopy of the woodland in which it is growing, the plant is multi-stemmed from the base, making it a shrub – though a very large one.

The exclusion of *Heptacodium miconioides* from *New Trees* can therefore be justified on technical grounds, but there is no doubt that it is an exceptionally

interesting and horticulturally valuable species that can be grown as the gardener wishes, either as a large billowing shrub or elegant small tree.

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