



Stewartia sinensis growing at Trewithen in Cornwall. The spectacular bark is just one of the many qualities of the genus *Stewartia* that was the subject of one of the Society's study days, held in Belgium.

Stewartia study days

On a warm, sunny Friday afternoon in late October members from all over Europe gathered on the cafeteria terrace of Kalmthout Arboretum before being led out by its Director Abraham Rammeloo. Abraham briefly introduced the arboretum and pointed out during the walk many of the outstanding trees in the collection focussing particularly on the different *Stewartia* species.

On Friday evening many of the participants had dinner together in the hotel, and after dinner Philippe de Spoelberch, who had masterminded the three-day study tour, gave a slide-show of his travels in Japan, which showed many trees and shrubs, including *stewartias* in the wild, and illustrated vividly many of the wonderful colours of leaves which we saw the next day.

This first visit served as good background to the study period on Saturday morning which took place in Wespelaar and introduced the systematics of hardy Theaceae and the genus *Stewartia* by Dr Koen Camelbeke (Director of the Arboretum Wespelaar); the identification of *Stewartia* species by Philippe de Spoelberch, followed by a workshop practical during which members split into groups and were given seven different fresh *stewartia* samples to identify,



Stewartia pseudocamellia 'Harold Hillier' growing at Herkenrode.

using the key previously introduced by Philippe; and the cultivation of *Stewartia* by Christophe Crock (Head Gardener at Herkenrode). These major topics are covered in the following articles. The morning finished with a slide show of *Stewartia* in the wild and gardens presented by Philippe.

After a copious sandwich lunch and an excellent glass of wine the group split into two for a visit of the *Stewartia* collection in the Arboretum Wespelaar and garden of Herkenrode, one group being guided by Philippe de Spoelberch, the other by the Arboretum Director, Koen Camelbeke. *Stewartia pseudocamellia* had suffered from the summer drought and was looking a little sad but all the other species were admired for their distinctive bark or striking autumn colours. A few spot idents were required along the way!

On Sunday a smaller group reconvened, this time at Hemelrijk, the de Belder family's arboretum, which has a rich collection of trees: the yellow birches stood out against the blue sky and the maples were starting to put on their fiery autumnal tints. The mini-tour finished with a delicious lunch in the garden and members left feeling very tired but very happy.

Hardy Theaceae and the genus *Stewartia*

KOEN CAMELBEKE

The family Theaceae is composed of seven to ten genera with 195 to 460 species, which come from the tropics and sub-tropics, especially the forests of southeast Asia. Each genus in the family is restricted to a single major geographic area except *Stewartia*. Members of the family are recognised by the leaves that are simple, toothed, leathery, often withering to red; the stipules are absent. The flowers are solitary with five showy petals, which are often white and slightly wrinkled. They have several series of numerous stamens in bundles or in a ring that are adnate to petals. The woody loculicidal capsule has a persistent central column. The bracteoles often grade into the sepals and pseudopollen is present.

There are three genera of the family Theaceae that are hardy and in cultivation in Belgium, *Camellia*, *Stewartia* and *Franklinia*; *Gordonia* and *Schima* together with the cross-genera \times *Schimlinia* and \times *Gordlinia* are hardy in milder areas of Europe.

There are a controversial 230 to 290 species of *Camellia*, the majority of which are native to China. They are evergreen trees or shrubs and have flowers that are mostly solitary or in two or three. There are two or more inflorescence bracts, five sepals, if distinct and five to 12 connate petals. There are many stamens that are often connate and basally adnate to the petals, the seeds are wingless and the genus is monophyletic.

Gordonia is a genus of two species that both come from the New World. They are columnar evergreen trees that can be up to 30m with shiny-toothed leaves. The flowers have long (up to 8cm) pedicels with five sepals and white flowers. The seed is apically winged.

Schima has one complex-polymorphous species (or approximately 20 species) that comes from Asia. It is an evergreen tree and the flowers have two bracteoles. The fruit is globose with a partially degenerated columella.

Franklinia alatamaha comes from southeast Georgia (USA) and was last seen in the wild in 1803. It is a multi-stemmed deciduous shrub or small tree. The capsules are globose to subglobose and a columella is present.

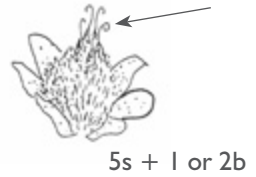
Franklinia has been hybridised with both *Gordonia* and *Schima* to give the two cross genera, \times *Gordlinia grandiflora* and \times *Schimlinia floribunda*.

There are approximately 20 species of *Stewartia*, both evergreen and deciduous. The leaf petioles are narrowly to broadly winged and they have two to four narrowly winged or wingless seeds per locule; there is no columella and the seeds are flattened.

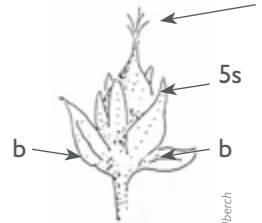
Key to the deciduous species of *Stewartia*

The following key is adapted from the one by Dr Stephen A. Spongberg (1974) in: A review of deciduous-leaved species of *Stewartia* (Theaceae), *Journal of the Arnold Arboretum* 55:182-214 (key, pp. 189-190).

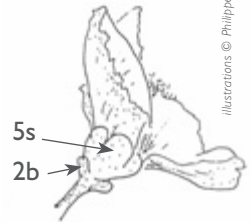
- A. Styles 5, distinct; petioles widely winged, enclosing the lateral and terminal buds; floral bract 1 or 2 (the latter soon falling off)
..... 1. *S. ovata*



- A. Styles united, terminating in 5 or 6 stigmatic crests or arms; petioles narrowly winged, not enclosing the lateral and terminal buds; floral bracts 2
..... B.



- B. Stamens with purplish filaments and bluish anthers; capsules dehiscent by the outward folding of the valve margins, the apices of the valves \pm coherent; seeds angular
..... 2. *S. malacodendron*

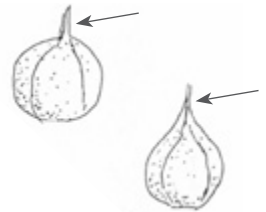


- B. Stamens with whitish filaments and yellow or orange anthers; capsules apically dehiscent, the valves spreading apart from the apex; seeds planoconvex
..... C.

- C. Floral bracts conspicuously shorter than the calyx; small trees with smooth, mottled bark; young branches usually compressed and zigzagged, rarely terete
..... 8. *S. pseudocamellia*



- C. Floral bracts about equalling or longer than the calyx; small or large trees or shrubs with smooth or fissured bark; young branches usually terete, not zigzagged
..... D.



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Above 7 different capsules of *Stewartia* (from left to right): *S. pseudocamellia*, *S. malacodendron*, *S. serrata*, *S. rostrata*, *S. sinensis*, *S. monodelpha* and *S. ovata*, which are key to identifying the species.

Opposite Flowers from the family Theaceae: (from top left clock-wise) *Camellia japonica* 'Madame Lourmand', *Franklinia alatamaha*, *Stewartia pseudocamellia*, *S. serrata* (Lenoir 1322), *S. ovata* 'Red Rose' and *S. malacodendron*.

Right *Stewartia rostrata*, **below**, *S. serrata* **left**, an unfertilised ovary and **right**, mature capsules.



Key to the deciduous species of *Stewartia*

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- D. Ovaries and/or capsules subglobose, completely glabrous or pubescent only at the very base
..... E.

- E. Ovaries and/or capsules pubescent only at the very base; sepals twisted, 4 ovules or seeds per locule; bark on older branches finely fissured
..... 4. *S. rostrata*

- E. Ovaries and/or capsules completely glabrous; sepals flat, 2 ovules or seeds per locule; bark on older branches smooth and mottled
..... 3. *S. serrata*

- D. Ovaries and/or capsules conical, pilose or appressed-pubescent over the entire surface
..... F.

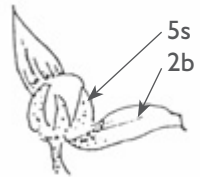
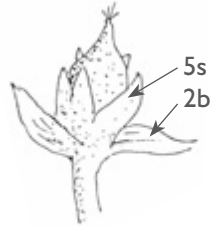
- F. Sepals oblong or ovate with acute apices
..... G.

- G. Floral bracts ovate, subequal to the sepals; styles 6-8mm long; seeds 7-9mm long
..... 5. *S. sinensis*

- G. Floral bracts oblong, conspicuously longer than the sepals; styles 3-4mm long; seeds 5-6mm long
..... 6. *S. monadelphica*

- F. Sepals ovoid with rounded, ciliate apices.
..... 7. *S. × henryae*

Illustrations © Philippe de Spoelbech



photograph © Philippe de Spoelberch



Stewartia pseudocamellia at the Arnold Arboretum in the USA and **below**, at Villa Taranto in Italy.

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photograph © Philippe de Spoelberch





Left top, *Stewartia monadelphica* colouring in autumn – this plant is growing in the garden at Herkenrode in Belgium and has occasional lobed leaves;
below left, *S. monadelphica* 'Black Dog' growing at Hergest Croft in Herefordshire, England.

Below *S. monadelphica* at the Barnes Arboretum in Pennsylvania.



The propagation of *Stewartia*

CHRISTOPHE CROCK

Propagation from seed

Plant material Most *Stewartia* are self-fertile: tests show a high percentage of germination of seed collected on isolated plants; but some species, particularly the American ones such as *S. ovata* and *S. malacodendron*, seem to achieve better fertilization when the population of *stewartia* is bigger than 20. It is essential that the plants do not have the same DNA, ie, not cuttings or grafts of the same clone.

The health of the plant influences significantly the quality of the seeds produced. The climatic conditions can also influence the quality of the seeds: too much heat after pollinisation can affect the development of the seeds. A bit of humidity during the summer seems to be very important for the specimens found in the wild as the average summer maximum temperature in

their natural habitat in the summer is 35°C.

The seed is naturally dispersed by the wind, birds (chickadee, *Poecile atricapillus*, and nuthatches, *Sitta carolinensis*) and squirrels. In America, birds and squirrels eat the woody seed capsule when it is still on the tree and let the seed fall on the ground. The best time to harvest the seed is about mid September, when the capsules change from green to brown or even a little earlier when still green but of course, mature.

Technique Most *Stewartia* species have doubly dormant seeds and there are two different solutions to breaking the dormancy.

The first is to stratify the seed before sowing by giving the mature seed harvested in September or October a succession of warm (three months) and cold (three months) stratification. The seed can then be sown in April or May.

The second is to sow the fresh seed in 1 litre pots, which are left in a cold frame outside, allowing nature to do its work. They can even be raised in beds using a pine bark, free-draining medium. This is particularly good as young seedlings don't like to be transplanted. It is advisable to cover the raised bed or frame with wire mesh which helps to prevent mice from eating the seed.

Some of the stratified seed will start to germinate within five months but germinating is not uniform and seed germination will continue during a few months or even years. The freshly sown seed will germinate during a period of two to five years.

Sowing media

<u>Asiatic <i>Stewartia</i></u>		<u>American <i>Stewartia</i></u>	
Compost	50%	Compost	20%
Acidic compost	10%	Acidic compost	10%
Fine bark 0-15mm	20%	Coarse sand	20%
Perlite	10%	Fine bark 0-15mm	40%
Fine gravel	10%	Perlite	10%

Growing conditions in the greenhouse

Asiatic *Stewartia* Water the pots to keep growing medium moist but never wet. Just prevent the seed from ever getting dry. Once germination occurs, start to water a little more, as the plants require it.

American *Stewartia* This group does not like moisture, as they grow in very dry conditions in the wild. They don't either seem to like water on the leaves and on the new shoots so it seems better to water from the base as soon as the young roots reach the bottom of the pot. To improve this way of watering, some growers use pots with open bases with a medium composed nearly entirely of pine bark.



photographs © Philippe de Spoelberch



Left, the autumn foliage of *Stewartia malacodendron* and right, *Stewartia pseudocamellia*

Propagation by cuttings

Plant material Stock plants should be vigorous and juvenile, 18 month plants are the best. The propagules should be collected from upright shoots or from vigorous horizontal branches. Softwood cuttings should be collected at the end of June (depending on the local climate), if this is not possible semi-hardwood cuttings can be collected a little later but softwood cuttings are the easiest to strike. It is advisable to collect cuttings in the morning before 10am and to insert them as soon as possible.

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Technique 10cm cuttings using rooting hormone (IBA) at a low concentration (2000 to 4000ppm) with wounding gives the best results. Professionals can also use caffeic acid or ascorbic acid.

Media The cuttings should be inserted into a mix of 1:1 perlite and peat or coir for the Asiatic stewartia and a mix of 1:1:1 perlite, peat or coir and fine pine bark for American stewartias.

Growing conditions in the greenhouse the cuttings should be placed under mist or in a place with very high relative humidity. Less misting and moisture is required for the American stewartias. A low concentration foliar feed should be applied twice a month.

Repotting Check rooting at the end of July, or in early August. The plants that have more than three roots can be repotted directly and put in a frame under 70% shade. Those that have not rooted will be repotted in the next spring (February / March). Use the same media for potting as for sowing.

Adapting plants to outdoor conditions After a few weeks under shade, young cuttings should be gradually brought into a more sunny position starting in



Stewartia pseudocamellia in the garden at Herkenrode, Belgium.

a shady spot under trees in the garden and then slowly moving them into more light.

Getting through the winter Plants should be hardened off into the autumn and brought into a cold polytunnel or greenhouse before the first night frosts occur, where they can be kept until early spring (February/March). During the winter it is best to keep the growing medium quite dry and to provide ventilation to avoid rotting at the base of the young plants.

In the spring bring the cuttings into a warm greenhouse and provide an extended photoperiod to encourage a flush of growth. When this occurs it is time to repot the plants that had not been repotted previously. It is always best to repot plants when they are growing and not dormant.

Propagation by layering

Technique In autumn, choose a young flexible, healthy branch that is growing close to the ground. Pin it down into the ground, to a depth of about 10cm, and then bend it upwards using a bamboo stick. The last 20cm of the branch should be as vertical as possible and out of the ground. To increase the chances of success the ground around the mother plant should be good humus-rich garden soil. If this is not the case it should be improved by adding some compost. Once the branches start to root wait for two more growing

**Opposite**

The group of participants to the Stewartia study days at Hemelrijk.

Left

Diane van Strydonck and Daniel de Belder with 200+ year old *Stewartia monodelpha* from Yakushima.

seasons before taking the young layer away from the mother plant. These two years of rooting give the layer a greater chance of survival.

The cultivation and maintenance of *Stewartia*

Asiatic stewartia should be planted in humus rich acidic garden soil. In the wild they grow where there are gaps in the canopy so that they are not exposed to direct sun all day long and will grow very well in cool open woodland conditions where they will only have full sun for a few hours a day. Asiatic stewartias need a cool soil with enough water during the summer but they don't like waterlogged conditions. Make sure that you choose a position where there is enough space for the plant to develop.

Do as little pruning as possible, respecting their natural growing habit. Most of the Asiatic species will be multi-stemmed. *Stewartia pseudocamellia* and *S. monodelpha* may have a single leader depending on the clone and origin. Most plants will be happy with an annual layer of good mulch and there is little to gain from fertilising them. In poor soil they may appreciate a little manure. Only water plants during an extended summer drought as too much watering discourages the plant from building up a good root structure.

American stewartia need very free draining humus-rich acidic soil and can even be planted into pure leaf mould or even pine bark. These media provide very good drainage and prevent root rot. If the summers tend to be wet it is a good idea to plant these species above the ground on a little mound of soil as this will help the roots to stay dry. As with their Asiatic counterparts they grow in the wild in the canopy gaps where the average maximum summer temperature is 35°C. They will grow very well in 'hot' open woodland conditions. *Stewartia malacodendron* and *S. ovata* are probably the most sun and



heat tolerant of all the *stewartia*. In our western European climate with cool summers, we should possibly plant American *stewartias* in a sunny spot. These species don't need much water so watering is rarely a necessity. Remember to choose a spot where there is enough space for the plant to develop fully.

Prune as little as possible and respect the plant's natural growth habit. These *stewartias* are mainly multi-stemmed shrubs, so don't be tempted to prune stems as they are the plant's way of making sure that there is a succession of healthy stems. Most will be happy with a good mulch every year. They grow in very poor soil in the wild and fertilizing them will kill them. Only water young plants during an extended summer drought.

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The two-day mini-tour and study day was organised by Philippe de Spoelberch and took place from 23 to 25 October 2009. Grateful thanks are extended not only to Philippe but also to Dr Koen Camelbeke, Director of Arboretum Wespelaar, Christophe Crock, Head Gardener at Herkenrode and Vera de Prins who took care of the administration. Also to Abraham Rammeloo, Director at Kalmthout Arboretum, and to Danny and Barbara de Belder, Diane van Strydonck at Hemelrijk.

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