The flowers of the Amur maple (*Acer caudatum* subsp. *ukurunduense*) are strictly on upright spikes (see article on maple flowers pages 14-21).

Acer maximowiczianum

Maple flowers

The genus *Acer* is most frequently admired for its autumn colour and in some species its bark but one less well documented attribute is the diversity and beauty of its inflorescences. **PETER GREGORY** has been studying them for his new book on the identification of maples, *What Maple is that?*, and writes about the many different forms and colours the different species have.

Maples are very popular for tree collections, landscaping, gardens of all sizes, patios, containers and bonsai, because of the great variety and versatility of the numerous species. They are admired for the wide choice of sizes, shapes, bark patterns, and the remarkable variations in their leaf features – size, shape, colour, toothing, hairiness, etc. These very wide ranging differences in maple leaves are also matched by the maple flowers which, with a few exceptions, are rarely noticed or commented on.

Flowering shoots

Maple species vary in the number of flowers produced on their flowering shoots. Several maples with compound leaves, such as the Nikko maple (*Acer maximowiczianum*) have just three flowers in each inflorescence. In contrast, the box elder (*A. negundo*) has masses of flowers along each string-like inflorescence. Most other species have various numbers of flowers between these two extremes.

The flowers of the hornbeam maple (*Acer carpinifolium*) are on long

Acer carpinifolium

Acer stachyophyllum

hanging strings, while those of the birch-leaf maple (*A. stachyophyllum*) occur in pendulous tassels. The Caucasian maple (*A. velutinum*) has its flowers in clusters – while those of the Amur maple (*A. caudatum* subsp. *ukurunduense*, page 13) are on strictly upright spikes.

Depending on species, the main flowering stalk may be leafless or, like the Rocky Mountain maple (*A. glabrum* subsp. *douglasii*), it may have a pair of leaves at the base.

Acer velutinum

Acer glabrum subsp. *douglasii*

The flowers

Maple species also differ in the individual flower shape, size and colour, plus the various flower parts. The flowers of the heart-shaped maple (*Acer cordatum*) and most snakebark maples such as *A. pensylvanicum*, *A. capillipes* and *A. rufinerve* are saucer- shaped. Those of the devil's maple (*A. diabolicum*) are cup-shaped, while the flowers of the bearded maple (*A. barbinerve*) are urn-shaped. A bell-shaped flower occurs in the small-flowered maple (*A. micranthum*, page 20), while that of the fire maple (*A. tataricum*, page 19) is almost completely round.

The David's maple (*Acer davidii*)

Acer monpessulanum

Acer sinopurpurescens

has yellow flowers, but they are greenish in the Montpelier maple (*Acer monpessulanum*). The flower of the Chinese purple maple (*Acer sinopurpurescens*) is red, while that of the woolly-flowered maple (*A. erianthum*) is white.

Sepals and petals Many maples, such as the elegant maple *A. elegantulum* have five sepals and petals. Exceptions include the spike-leaved maple (*A. stachyophyllum*) and its close relatives, which have 4 sepals and petals. The petals are absent in the the box elder (*A. negundo*).

In some species, such as the coated maple (*A. tegmentosum*), the sepals and petals are similar. In others, they differ in size, colour, shape and hairiness. Faber's maple (*A. fabri*) has small red sepals and longer broader white petals.

Acer tegmentosum

Acer erianthum

Acer fabri

Acer triflorum

The white inrolled flower petals of the vine maple (*A. circinatum*) contrast with its red backward pointing ovate sepals.

The densely hairy sepals of the mountain maple (*A. spicatum*) are very small and curve inwards in marked contrast to the hairless thin strap-like petals.

Stamens Maple species also differ in the number of stamens in the flower. Many species, like the moosewood (*A. pensylvanicum*), have 8 stamens. Some, such as the birch-leaved maple (*A. stachyophyllum*, page 15), have 4-6, while others have 10-12. The shaggy-bark maple (*A. triflorum*) is an example of the latter. Each stamen consists of a stalk and anther. The anthers are usually yellow to orange, but they are bright red in species such as Campbell's maple (*A. campbellii*) and many others in the *Palmata* Section.

Acer circinatum

Acer campbellii

Honey disc The flower of Campbell's maple (*A. campbellii*) also has the stamens inserted on top of the round honey disc. In some species, they are inserted around the notched edge of the disc. The moosewood (*Acer pensylvanicum*) is an example of this. In others, such as the shaggy-bark maple (*A. triflorum*), the stamens are inserted alternately on top of and around the edge of the disc.

photograph © Hugh Angus

Acer mandshuricum

Ovary The ovary arises from the centre of the honey disc and may have a smooth surface in some species, or may be covered in hairs in others such as the woolly-flowered maple (*Acer erianthum*). The close-up on page 16 shows why it is called the woolly-flowered maple. The style and stigma are usually whitish to yellowish, but are reddish in some species, such as the Manchurian maple *A. mandshuricum*).

Pollination

Depending upon species, maple flowers appear at any time from mid-February to mid-June, and may be pollinated by insects or wind. Insect pollination is the most efficient, but it does involve the need to attract insect visitors to the flowers – bees, butterflies, flies and beetles.

Bees/Butterflies The flowers of many maple species secrete nectar, the sweet fluid with which bees make their honey. Such flowers advertise this either by having colourful sepals and petals, emitting enticing smells, or with a combination of both.

For example, the small colourful flowers of Fabre's maple (*A. fabri*, page 17) emit a lovely sweet fragrance. Its honey disc is yellow when the ovary is ready to be pollinated. Once pollinated, the nectar is no longer produced and the honey disc changes colour to orange, then red. Young bees fly to any flower, regardless of the disc colour, whereas adult bees only fly to flowers with a yellow disc. This shows that, like some of us, an insect has a brain and can learn by experience.

Flies/beetles Some maples, such as the Amur maple (*A. tataricum* subsp. *ginnala*) are pollinated by flies and beetles. The pungent maple (*A. sterculiaceum*) is another example. The insects are attracted by the pungent

Acer tataricum subsp. *ginnala*

Acer sterculiaceum

Acer negundo

odours this species emits when the flowers ripen in late April. In other words, the flowers stink – which is why the pungent maple is named after Sterculius, the god of smells – a sort of lord of the loos.

The earliest flowering plants, such as magnolias, evolved some 120 million years ago, long before bees and butterflies appeared on the scene. Hence, they were all pollinated by flies and beetles, or the wind.

Wind pollination Wind-pollinated maples produce their pollen in enormous quantities to ensure success, scattering it over everything – trees, grasses and people. The box-elder (*A. negundo*) is a classic example. There is no real need for fragrant or alluring odours to attract the wind. In fact, the simpler the flower, the better. To ensure success, the pollen must be produced in these huge amounts. Then the plants depend upon the mercy of the wind to carry at least some of the pollen to the stigmas of female plants of the same species.

Self-pollination Some maple species are very prim and proper, with male and female flowers on separate trees. The pungent maple and box-elder are examples. At the other extreme, the female ovary and male stamens may not only be on the same tree, shoot or flower cluster but, like the Norway maple

Acer platanoides

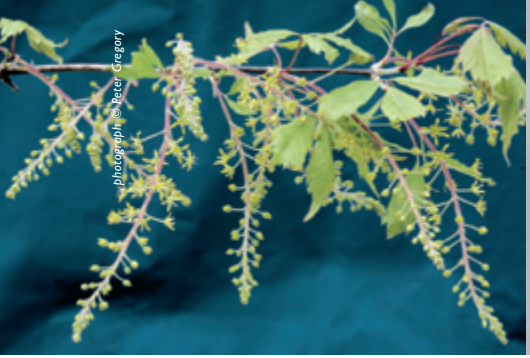
Acer micranthum

(*Acer platanoides*), they may even be crowded together in the same flower – what would seem to be sheer lust.

In practice, these maples can prevent self-pollination by chemical means or by timing. For instance, in some species such as the hornbeam maple (*A. carpinifolium*), the ovary is receptive before the stamens become active. In many other species, either the stamens do not ripen or the ovaries do not fully develop.

This difference in timing also occurs with closely related species native to the same areas. Two of the smallest snakebarks, the small-flowered maple (*A. micranthum*) and Tschonoski's maple (*A. tschonoskii*), grow in the same mountain regions of Japan – the former at lower and the latter at higher elevations. However, their upper and lower boundaries overlap. They do not cross-pollinate because Tschonoski's maple flowers in early April, while the flowers of the small-flowered maple do not ripen until June.

Acer tschonoskii



Acer cissifolium *Acer diabolicum*

Exceptions The means of preventing self-pollination do not seem to be foolproof. The vine-leaf maple (*A. cissifolium*) has male and female flowers on separate trees. If isolated with no male trees nearby, a female still produces masses of infertile fruits.

Just occasionally there is a tiny percentage of fertile seed produced. It would seem that one or two flowers must have produced active stamens.

An old isolated male devil's maple (*A. diabolicum*) at Westonbirt Arboretum, Gloucestershire, England, was not looking very healthy one year. The following summer it produced several clumps of fertile fruits, indicating some flowers had formed active female organs. Whether these lapses are dependant on tree health or vigour, hormone balance, the current or previous year's weather, or a combination of factors, who knows–but it would be fascinating to find out.

Finale

This great variety in the many maple flowers is truly marvellous. Almost every flowering system known to man can be found in this one remarkable genus. Floral characteristics are used in many floras and identification keys. But, the flowers appear for only a relatively short period–rarely at the time you see a tree you want to put a name to.

Not surprisingly, this wonderful variation in maple flowers plays a major role in the widely accepted system of maple classification by Dr Piet de Jong. By using these variations in the flowers in an identification key, with possible support from the leaf/shoot characteristics present, it enables a maple to be neatly slotted into the appropriate section or series of the classification system.

Note Incidently, there is a group of *Acer palmatum* cultivars, misleadingly referred to as the "flowering maples" because of their brightly coloured spring foliage. One example is the attractive *A. palmatum* 'Hikasayama'. It is named after a snow-capped mountain north west of Tokyo which glows pink and white in the evening sunset. "Hikasa yama" means the red and white mountain.