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by Hugh Johnson

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The Fruit

THE FRUIT OF A BROADLEAF TREE (or any flowering plant) is the female part of the flower – the ovary, with the ovule inside—fertilized and grown to ripeness. The ovule becomes the seed; the ovary the seed's covering. Taking the peach as an example, the ovule is the kernel of the stone, the ovary is its shell. Round it is a fleshy covering which is a development not of the flower itself, but of the stem just below it.

Conifers are technically quite different. Their ovules never have ovaries; the kernel has no shell. They may, however, (as juniper berries do) have a fleshy covering; again derived, like the peach's flesh, from their former stalks.

Fruit always has one simple purpose: to put as much distance as possible between itself and its parent tree. Some of nature's most inventive adaptations come into play to persuade the birds, the beasts and the elements to cooperate.

When a tree clothes its seed in a substantial parcel of sweet flesh, as plums for example do, it is sacrificing a great deal of hard-won starch to make sure of interesting the birds. Come to that the flowers alone, put out to attract insects, use a fair quantity. Someone calculated that the 200,000 flowers on one cherry tree used 25 pounds of starch. Almost all fruit serves simply to feed animals. Yet so big and so long-lived are the forest-trees that if one in a hundred of the acorns produced escapes being eaten, and one in a hundred of these

germinates, and one in a hundred of the seedlings survives to make a mature acorn-bearing oak, the oak population will remain the same.

Most seed ripens in the autumn, conifer seed in the second autumn after its fertilization. It is designed to spend the winter dormant either on the tree or on the ground; then to germinate the following spring. Winter cold is actually necessary to activate it and break its dormancy: a precaution against it germinating as soon as it falls only to be killed by the ensuing cold weather. When the gardener exposes his seed to cold and damp he calls it 'stratifying'. Seeds have been known to stay dormant for 1,000 years.

In the ripe seed there are the beginnings of a little root and a tiny shoot, with one or more seed-leaves which act as storage organs for food and usually as the first operating leaves of the new plant. These are the cotyledons, whose rather obscure influence pervades the whole world of plant classification. They remain within the seed supplying the initial first food that is needed for germination. Trees with two or more cotyledons produce wood in concentric rings: the classic tree pattern. Trees with only one grow as a cluster of fibrous bundles that gets longer but not fatter. The great 'Monocot' is the palm which relies on overlapping leaf bases, thickened enlarged



HOW SEEDS ARE DISTRIBUTED



Animals In hoarding acorns for winter feed, squirrels inevitably lose some in the ground so that they are effectively planted.



Birds Thousands of broadleaf species have their seeds distributed by birds who feed on their berries: it is an unusual adaptation for conifers.



Wind Willows and Poplars produce light seeds with a sail of cottony fluff which carries them miles. They need bare, preferably damp ground to survive.



Catapult Witch Hazel is one of a number of plants that have contrived a mechanism to catapult their seeds into open ground, as much as 40 feet from the parent.

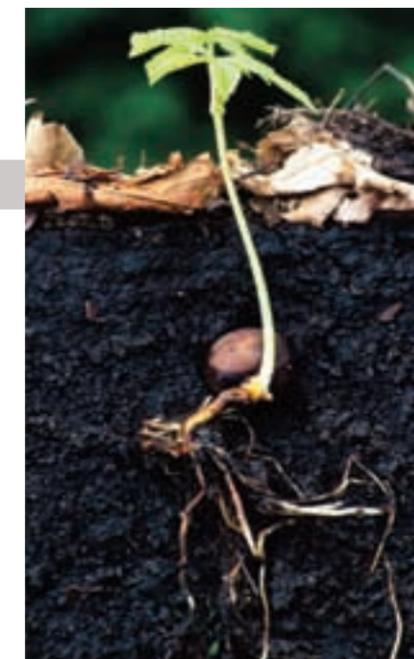


Air pockets (bladders) full of air enable the seeds of alders and other waterside trees to float downstream to a damp place to germinate.



Maple keys The dry, winged seeds are split in two at an angle of 60 degrees, making them aerodynamic enough to float to fertile ground. These are red maple.

The common mountain ash of Europe, or rowan (left), with its heavy trusses of scarlet berries is only one of a branch of the rose family ranging from Newfoundland to North Carolina in the northern hemisphere.



THE STAGES OF GERMINATION

The various stages in germination are shown from the cracking of the seed case, through to the fully grown seedling.

The progress from seed to seedling begins first when, usually in the Spring, after the seed has been sown, the root tip splits the outer covering of the seed (1). The cotyledons are fully developed at this stage, but remain in the seed husk. There is enough fuel stored in the seed to power the rootlet until, guided by gravity, it turns downwards and buries its tip in the earth (2). From that moment it can supplement the seed's supplies and provide energy for the seed-leaves to swell up and emerge. The root grows deeper (3) and (4) the seed case is shed.

The final stages in germination are reached when the stem of the seedling straightens and the seed-leaves fan out and start the process of photosynthesis (5). At this point, the tiny bud in their midst will swell to produce the stem and the first true leaves of a new tree (6).



1. Seed case cracks open



2. Root emerging from the seed case



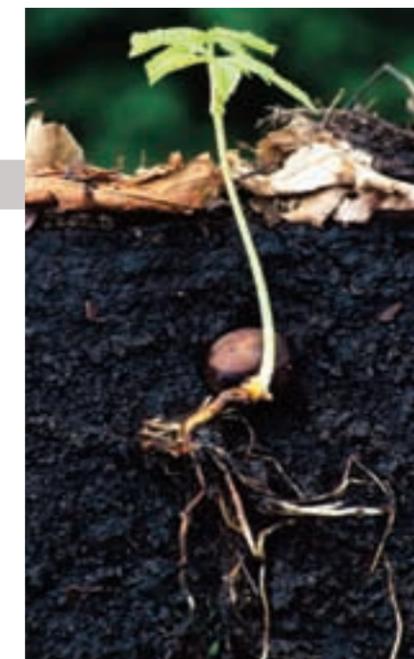
3. Root grows deeper



4. Shedding the seed case



5. Reaching for the light



6. One month on and coming into leaf

The Pines of North America

PINES ARE TO THE CONIFERS what oaks are to the broadleaves: the most widespread, most varied and most valuable trees of their order. The biggest family of conifers goes by their name, the Pinaceae. It includes the firs, spruces, cedars, larches – almost all the needle trees. But the actual genus *Pinus*, the pines proper, is limited to 100 or so species with certain clear and obvious characteristics, of which the easiest to see and remember is the relatively long evergreen needles in tight bundles, each bundle (of from two to five needles, according to species) wrapped at its base in a papery sheath.

The yearly growth of each shoot of a pine takes the form of a 'candle'. Firs and spruces and the rest add to their branches every year more or less horizontally; pine-candles tend to grow vertically, only settling down to their place as part of the branch later, as they grow heavier.

In contrast to its aspiring new shoots, however, a pine is much less forceful than its cousins in its defiance of gravity. A fir or a spruce is a spire as a young tree, and a spire it remains. Most pines, where they have room to expand, take a course in middle age which brings them nearer to the wide-spreading broadleaves. The result – an eccentric flourish of bold branches, often on a bare stem, usually with beautifully coloured and patterned bark – is one of the most triumphantly picturesque of all trees.

Standard bearers

As old trees are the standard-bearers of the skyline. But the owner of a young pine has, if anything, even more to enjoy: a vigorous plant at eye level, fantastically rich in its detail, its thick and sappy shoots bristling with bright new needles, embossed with male and female parts of splendidly original and suggestive design.

The natural range of the pines is enormous. They grow from the Arctic Circle to the Equator. If anything they favour rugged conditions: drought and extreme exposure on mountains; on sandy seashores, where the subsoil is permanently frozen; or, like the famous Jeffrey pine, on a rocky dome high above Yosemite, where there seems to be no soil at all. If pines have a headquarters in our era it is in Mexico, whose tropical highlands they seem to relish. With their evolutionary tactics of interbreeding they keep botanists busier there than anywhere else on earth.

Of the hundred-odd known pine species 36 are natives of North America. They divide readily into northeastern, southeastern and western staples. Anyone planting one should certainly consider the trees of his own area first – not forgetting, of course, the imports from Europe, Asia and Mexico.

The great pine of the northeast is the white or Weymouth pine (*Pinus strobus*). The old New England forest, which was relentlessly butchered over a period of 300 years, contained vast stands of it,



with trees 200 feet high and eight or nine feet across. Its beautiful soft white wood supplied half Europe's needs, as well as building boats and panelling mansions throughout the eastern States. It was introduced to Britain in the 18th century by Viscount Weymouth, who planted it at Longleat. In Britain it has never been a great success: but in France and Germany there are good woods of it. Its thin, pale needles of a delicate blue-green make it a beautiful garden tree; it will keep long branches low-down, where you can see them. But it will make a giant eventually – far too big for the ordinary garden. Neither of the other two northeastern pines, the

red pine (*P. resinosa*) and the pitch pine (*P. rigida*), are nearly as big or as beautiful. The red is a sombre tree, dark green with dark red bark, its foliage heavy like that of the Corsican pine; the pitch pine is generally considered a last-resort tree for really rough conditions, where it can cut a rugged, romantic figure. Its peculiarity of sprouting tufts of green leaves from its trunk makes it easy to pick out. In Canada the jack pine (*P. banksiana*) and in the eastern States the scrub pine (*P. virginiana*) are small trees which play similar tough roles. Southeastern pines are of enormous economic importance, and of great interest and vigour. They cover thousands

A lone Monterey Pine clings to the rock on the coast of California, one of the few places where it still grows in its natural setting. It is restricted to a few miles here, but in the Southern hemisphere it has become a key forestry tree.

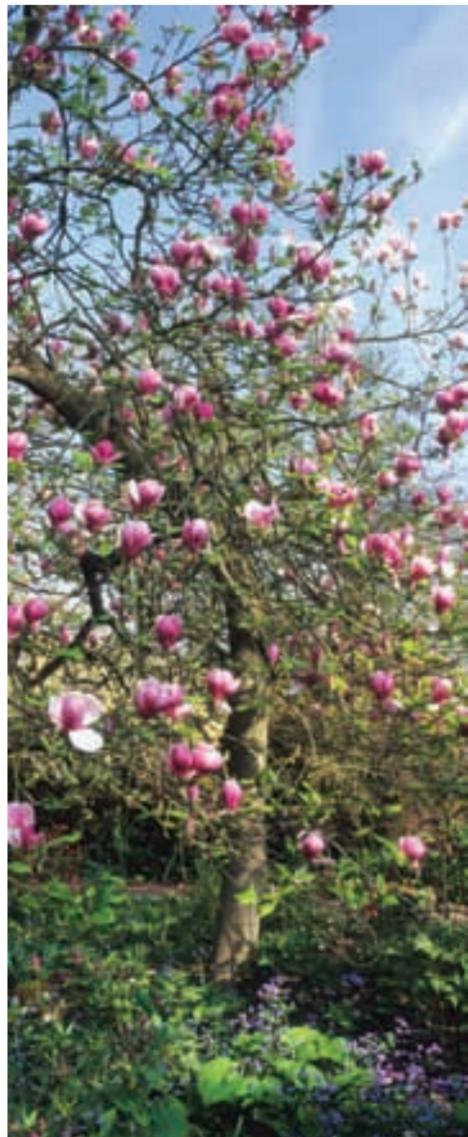
of square miles of torpid, otherwise unprofitable country. Yet none of them is exactly a beauty. The strange one is the longleaf pine (*P. palustris*). Long indeed are its needles – as much as 18 inches. But its real quirk is to crouch, a mere grassy mound of potential pine tree, for as much as three or four years before it starts to put on height. In its 'grass stage' it can survive forest fires and at the same time build up a strong root system to boost its later growth.

You can hardly grow a more adaptable, less demanding tree, or one that grows faster. In the wild it grows in the Great Smokies and along the Ohio River, but its range reaches from the Great Lakes to the Gulf of Mexico. It should be planted small: like all magnolias it has vulnerable fleshy roots and one of them is a deep taproot. Ideally it likes deep loose soil and a wet spring. A seedling with all its prayers answered has grown 50 feet in 11 years. But tulip trees soldier on in polluted air, mutilated by amateur tree surgeons, in disease (they catch few) and drought (provided there is a moist sub-soil).

They have an individuality that makes one think of the ginkgo. There is no other leaf quite this shape. It sets off like a maple leaf, with pointed lobes at the sides, but where the third and biggest

lobe should come to a point it is cut off short. Again ginkgo-like, it keeps up an even, fresh, medium green from spring to autumn, then changes to a clear light yellow. I can never understand the prejudice that autumn colour is not colour unless it is red. A hundred feet of fresh farm butter is a stirring sight.

As for the tulips, which open in May or June, it's a pity they are not often within reach: their sumptuous flowers are beloved by bees, with pale green petals opening to show a soft orange lining and a noble array of parts. The tree has a similar Chinese counterpart; less different indeed than one or two odd cultivars which have cropped up. There is an upright one, a variegated one and one without the side lobes so that the leaves are virtually rectangular.



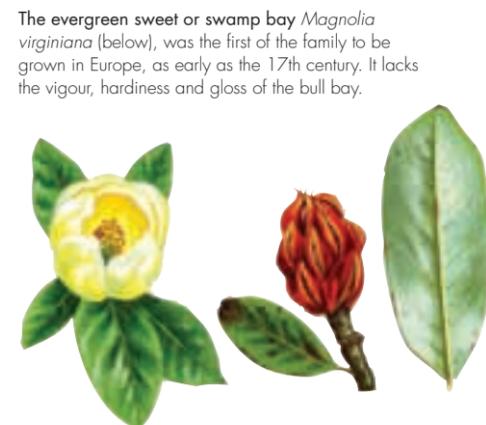
The most splendid form (above) of the most popular garden hybrid magnolia is the huge-flowered *Magnolia x soulangeana* 'Lennei'. It was discovered in a garden in northern Italy in 1850.



The scented creamy flowers (left) of *Magnolia grandiflora*. Some forms of bull bay, notably 'Goliath', have flowers up to ten inches across, produced in great numbers from mid-summer on.



The Chinese evergreen *Magnolia delavayi* (below) is rival to the bull bay, has enormous leaves with milky-green undersides. It is just as hardy, but has never achieved the same popularity. It flowers in late summer.



The evergreen sweet or swamp bay *Magnolia virginiana* (below), was the first of the family to be grown in Europe, as early as the 17th century. It lacks the vigour, hardiness and gloss of the bull bay.



The bigleaf magnolia (shown above), *M. macrophylla*, with leaves up to two feet long, is another native of the southern States, but deciduous. Its huge flowers (up to 12 inches across) are sweetly scented.

When and how tall

Magnolias proper can reach almost the same colossal heights, but many stay obligingly near eye-level. It is probably in terms of size that they can be most usefully catalogued; that, and the crucial question of when they flower.

There are really three major types of magnolias. One is the evergreen, of which *Magnolia grandiflora*, the bull bay of the Deep South, is the prime example. The second is the deciduous magnolia that flowers in summer, so that its leaves set off (or hide, as the case may be) the flowers, which are tulip-shaped, opening to saucers. The third is the kind that flowers before the leaves. Most of them are small trees, some are shrubs, and all are from the Far East. There is a superannuated subgenus name for these: Gwillimias. It



The magnolia (above) that bears 'Chinese' Wilson's name, *M. wilsonii*, was discovered by him in China in 1908. Its pure-white flowers face downwards, coming after the leaves in summer. It makes a wide shrub rather than a tree.



The cucumber tree (right) of the eastern States has flowers in quiet tones of green-yellow and metallic blue-purple. *Magnolia acuminata* forms a tall tree with splendid big leaves. The 'cucumbers' are its fruit.

The early-flowering *M. x soulangeana* (left) is one of the most popular hybrids of all. It was bred in France in the 19th century, a cross between *M. denudata* and the purple-flushed *M. liliiflora*.



has no more modern validity than retinospora, but I like the Welsh feeling about it-and why not make a distinction of plants that are, to you and me, distinct?

Gwillimias in turn can be divided first into tulip-flowered and star-flowered kinds and then into the few big trees (all tulip-flowered) and the rest, which are small-to-medium. The bull bay (what a dreadfully hearty name for such a voluptuous plant) must be counted the all-round champion of the magnolias. In the forests of the south it grows well over 100 feet and regularly delivers a heavy, creamy, scented flower on every shoot, making sackfuls of seed. Its leaves are beautiful: best when they unfold with a layer of velvet rust underneath, but always glistening and trim. Furthermore they dry well and keep for ever: year after year we have, as

The Kobushi magnolia, *M. kobus*, (below) is a near relative of *M. stellata*, but taller and slower to flower



Magnolia obovata (below) from Japan has creamy-white fragrant flowers with a ring of crimson stamens.



The maples, with the flowering cherries and the pines, are the cornerstone of Japanese gardening. They are the second annual event: April brings white and soft pink to the gardens and the woods; October the flame colours of ripening maple leaves. Composing tone poems with maples, however, is a less exact art than it is with cherries. For you never know exactly what colour a maple will turn. And cherries are constant year after year; maples louder or fainter according to the season.

None of the maples of the East is a big tree. Fifty feet is about as high as any of them go. But they have an incomparably rich range of variations on their elegant theme. Central China is the great reservoir of species. Many of the Japanese trees were imported from China in the distant past.

As far as the West is concerned the Japanese maple is the little shrub-size but tree-shaped plant with a domed head and fine-cut, often dark red, foliage. This particular tree, the most popular of all garden maples, is *A. palmatum*. 'Atropurpureum' is the dark red

Birch-like peeling bark in the warmest tones of red-brown. It is among the bigger oriental maples, growing as high as 45 feet, though slowly.



Her's Chinese maple (*Acer hersii*) and the very similar *A. davidii* have some of the best striped bark. The leaves of David's turn yellow in autumn. Hers's turn bright red.

variety. Nurseries have concentrated on two variables; leaf colour and leaf shape. There are bright green, pale gold and bronzy green, as well as various mottlings and marginations, besides the red form.

There is a second group, all known as *A. palmatum* 'Dissectum', with their leaves cut right down to the stalk in a series of almost needle-like lobes. These are the weakest-growing kinds, never reaching tree height. They also come in red, bronze, purple and green. And there is a third group of relatively vigorous small trees with bigger leaf-lobes; normally seven of them, each with a serrated edge. Three of the best of these are *A. palmatum* 'Senkaki', which has red twigs and colours a thrilling clear yellow in autumn; *A. palmatum* 'Linearilobum', whose green or red leaves are shredded as deeply as the 'Dissectum' maples; and 'Heptalobum Osakazuki', which simply turns furnace-red for a fortnight in October.

The original 'Osakazuki' tree, imported from Japan in 1886, is at the British national arboretum at Westonbirt; 30 feet high with half a dozen stems. Although it is wellshaded by a huge red oak it lights its dark corner like a lantern. A glade at Westonbirt is given to