
Opening Extract from...

Ancient Trees

Written by Anna Lewington

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Ancient Trees

Kew
ROYAL BOTANIC GARDENS

Ancient Trees

Trees that live for a thousand years

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Anna Lewington

BATSFORD

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Foreword

I am fortunate in having a wonderful job as the head of the arboretum at the Royal Botanic Gardens, Kew, and to have travelled extensively across the globe with my work, observing and collecting seeds and herbarium specimens of trees to maintain and improve the scientific value of the temperate woody plant collections in the arboretum.

One of my first seed-collecting expeditions was in 1985, to the temperate regions of Chile, where there are some incredible forests and amazing trees, including some very rare ones that in cultivation can only be found in specialist collections. It was here that I saw my first exceptionally large ancient trees of around 2,000 years old in their native habitat, the Cordillera de Nahuelbuta in the Araucanía region of Chile. These trees were monkey puzzles (*Araucaria araucana*). As we rounded the bend of a dirt track on our way to the mountains, we came upon a breathtaking sight: the distant horizon, with the architectural silhouettes of this uniquely shaped tree dominating the skyline, gave me a memory that will be with me for the rest of my life. Even though I was familiar with this tree, common in gardens at home, I was nonetheless fascinated by this pure forest of prehistoric-looking living fossils, and I needed to know and understand more about the natural history and ecology of this incredible relic.

We spent several days botanizing and collecting, among some of the largest monkey puzzles that I have ever seen and am ever likely to see again, their bases resembling giant elephant's feet and their distinctive, dark-barked trunks rising up into the foggy skies, where their branched tops dominate. Later into the six-week expedition we ventured further south in Chile to see the alerces (*Fitzroya cupressoides*) of Alerce Andino National Park in the Los Lagos region of the Andes. Like the monkey puzzle, this is a very rare tree in the wild, threatened with over-exploitation because its highly durable timber is in demand for roof shingles, and to see any specimens of this tree would be a treat. On seeing these magnificent 3,000-year-old monoliths of the Chilean forests, I was even more bewildered and lost for words. They are huge trees, growing to heights of 60m (197ft), with incredibly large boles in comparison with the smaller, cultivated specimens I had seen growing in gardens on the west coast of Scotland, where the climate from the Gulf Stream provides good conditions for growth. While we photographed and studied one extremely large tree, there was an eerie silence except for the roar of the river and a few birds, and every time I pass the 4m (13ft) tall specimen by the Redwood Grove at Kew, I am immediately reminded of this moment and transported back to the forest in Chile, clearly picturing these denizens of the forests of Alerce Andino and longing to return one day to catch up with them.

From those two pivotal moments on I became more intrigued by old, historic trees and the stories they hold, increasing my passion for working with trees even further. I love to hear other people's tales of meeting ancient trees, and wherever I am fortunate enough to go botanizing or collecting, I always ask local people if they know of any old or large trees, and relish the opportunity to observe them.

In 2001, while I was travelling in Sichuan, China, our guides, knowing my interest in old trees, took a detour into a village nestling on the banks of the Dadu River called Lengji to see an old maidenhair (*Ginkgo biloba*) tree. As we pulled off the road, the sheer size of this tree was evident, towering above the houses in the village. As we worked our way through the tiny network of paths, we finally reached our target. You can never prepare yourself for what you are about to see, and these first sightings all provide the same exhilarating feeling. The size, the girth and the spread all filled me with awe, but in addition, this tree had a beautiful red temple constructed in its base, complete with incense and candles. This very tree was seen and photographed by our most noted plant collector, Ernest Wilson, in 1908. The entire town came out to see us and were so excited that we had come all the way from England to see their tree that they gave us seeds, which now reside as trees in the arboretum at Kew, a living memory of the 'Lengji Ginkgo'.

I remember my first visit to see the giant redwoods (*Sequoiadendron giganteum*) in Mariposa Grove, Yosemite National Park, in great detail – I had read so much about these revered giants and seen pictures, but nothing could have prepared me for that day. When I first saw 'Grizzly Giant', the largest tree in the park with a diameter of 8.23m (27ft) at its base and over 2,500 years old, it was awe-inspiring: it is an amazing tree, holding itself magnificently far above the surrounding canopy and all the other conifers. This was another special moment in my life, and again I will never be able to describe how I felt; a time to contemplate. That very experience now draws me whenever I can to the west coast of the USA and Canada to witness the giants of the Pacific North-west coast: the coastal redwoods (*Sequoia sempervirens*), the Douglas firs (*Pseudotsuga menziesii*) and the sitka spruces (*Picea sitchensis*).

There is nothing more rewarding and inspiring than seeing these trees residing in their natural habitat, characterful trees that carry so many personal memories or have so many meanings and ethno-botanical links to mankind. It is not always possible for everyone to travel to these remote locations and see them in real life, but we are very lucky that the co-author of this book, Edward Parker, has captured so many of these hugely photogenic, ancient specimens in his photographs, and given everyone the opportunity to meet them. When I need some inspiration and I'm unable to sit under a monkey puzzle in the Araucanía region of Chile, I will sit in the comfort of my home, leafing my way through this wonderful book and being taken back in memory to see some of the ancient trees of the world.

Tony Kirkham
Head of the Arboretum, Royal Botanic Gardens, Kew

INTRODUCTION

The research for this book has taken us on a journey of discovery, not just around the world, but also through time. We have encountered giants whose enormous fluted trunks rise up like great cathedrals, and we have stood in groves of gnarled and wizened trees that were alive before the great pyramids of Ancient Egypt were built, standing in a desolate landscape that has remained virtually unchanged for 20,000 years. We have sensed the quiet power of some of the world's largest and oldest living organisms, and begun to understand the awe and reverence that many peoples in the past have felt. Standing in the presence of some of the world's oldest statesmen, it was impossible not to feel moved and to reflect upon the transience of our own human lives; impossible not to feel that we are part of natural cycles that are just too large for us to comprehend.

At the very beginning of this project, more than ten years ago, we were hoping to include some 24 species of trees that live to over 1,000 years old. As our research progressed, however, we discovered more and more examples of ancient trees from all around the world. The number of candidates has now risen to more than 100 species and the list is still growing. We were intrigued to find that ancient trees occur on all the continents of the globe, with the exception of Antarctica, and that many are easily accessible to millions of people – rural and urban alike. There are 1,000-year-old trees in the Chinese capital, Beijing; within a four-hour drive of Los Angeles; on the outskirts of London; and even close to the largest city in the Amazon rainforest, Manaus. It is pleasing to know that far from being the preserve of explorers and specialists, 1,000-year-old trees are widely enough scattered for many of us to enjoy and visit them easily.

The longevity of trees

No one knows which living tree is currently the oldest in the world or how many tree species produce individuals that live for over 1,000 years. However, we do know the trees with the oldest verifiable ages and almost all are conifers of one sort or another. The oldest living tree today with a full sequence of annual growth rings is a bristlecone pine that stands high in the White Mountains of California and, at the time of writing, is over 4,600 years old. Another bristlecone was believed to have lived for more than 5,000 years. It had 4,862 identifiable rings and a hollow in the middle. Unfortunately these discoveries were made as a result of studying the stump of the tree, which was felled in 1964. Several other trees have been verified to be over 2,000 years old. These include several giant sequoias (*Sequoiadendron giganteum*), which are over 3,000 years old, two

Among all the varied productions with which Nature has adorned the surface of the Earth, none awakens our sympathies, or interests our imagination so powerfully as those venerable trees which seem to have stood the lapse of ages, silent witnesses of the successive generations of man, to whose destiny they bear so touching a resemblance, alike in their budding, their prime and their decay.

JOHN MUIR, 1868

Ancient olive trees growing on Crete. The Minoans introduced olives to this Greek island over 5,000 years ago.

alerce trees (*Fitzroya cupressoides*), also giant conifers that occur in the temperate forests of south-central Chile, one of which has a verifiable age of 3,622 years, the other a recently discovered stump of a felled tree with all 4,080 tree rings intact, and surprisingly, a fig tree. Figs are usually very difficult to age accurately, but the bo tree or bodhi tree (*Ficus religiosa*) at Anuradhapura on the island of Sri Lanka – a cutting from the bodhi tree under which Buddha was said to have gained enlightenment – was planted in a temple garden in 288 BC and has been carefully tended ever since.

The problem with identifying the world's oldest trees is that, apart from counting the entire ring sequence, there is no single foolproof way of calculating the age of many of the most ancient individuals. The most common methods are counting annual tree rings and radiocarbon-dating material taken from the oldest part of the tree. However, both these methods only work on trees that have not become hollow, and involve damaging the tree to some extent in order to take a sample of material for analysis. This means that only a very small proportion of the world's ancient trees can be aged accurately, and that there may be trees even older than the ones listed above.

An estimate of a tree's age can be made from studying the growth rates of trees with known planting dates. For example, a number of ancient yews in the UK have been repeatedly measured, some over hundreds of years, to try and estimate age in relation to the girth of the trunk. In the UK, the Ancient Yew Group (AYG) has recently carried out research which suggests that a yew tree of 7m (23ft) or more in girth should be regarded as ancient and is at least 800 years old. However, it is known that ancient trees grow variably and extremely slowly in old age, leaving experts to speculate on the possible age of trees such as the Fortingall Yew

A thousand-year-old ginkgo tree growing near Seoul in South Korea.

in Scotland, whose hollow trunk was recorded with a circumference of over 16m (52ft) in 1769 by the Honourable Daines Barrington. This could make it 2,000 (or possibly 5,000) years old today.

In the case of most tropical trees, another problem is the absence of growth rings: because of the constant climatic conditions throughout the year, these are never formed. In the absence of hard evidence, it is possible to speculate wildly on the ages of some individuals. The French botanist Michel Adanson (1727–1806), who gave his name to the mighty baobabs (*Adansonia* spp.), caused a sensation in the eighteenth century when he estimated that a giant African tree was 6,000 years old, leading some to question the date of the biblical flood. Recent research on baobab trees in South Africa, however, has indicated that his calculations may not have been too far awry.

Ancient trees are now being discovered with regularity, but the discovery of the first Wollemi pine (*Wollemia nobilis*) in a deep gorge near Sydney in 1994 caused particular excitement, since this represented not just another ancient tree but a whole new species. Wollemi pines closely resemble the fossils of an extinct genus of the Araucariacae family that may date back at least 100 million years. According to Carrick Chambers, who was then Director of Sydney's Royal Botanic Gardens, the discovery was like 'finding a small dinosaur still alive on Earth'. Because of its ability to clone itself by coppicing (the creation of multiple trunks), the Wollemi pine could turn out to be one of the longest-lived species on the planet. The tree known affectionately as the Bill Tree – one of fewer than 100 individuals known to exist – may be more than 1,000 years old. Due to the pine's habit of producing a series of trunks, however, the current trunk of the Bill Tree may in fact be only a few hundred years old, while its rootstock could have been in existence since the time of the Roman Empire.

All around the world, exciting new research on ancient trees is being undertaken. China, for example, is home to a number of ancient ginkgo trees, some of which are considered to be over 3,000 years old; systematic studies are now not only throwing up new 1,000-year-old trees, but revealing the sheer numbers of ancient trees in various parts of the country. Researchers have identified more than 3,800 trees that are over 300 years old in Beijing alone, making it the city with the largest number of ancient trees in the world.

The Chinese modern master painter Xu Beihong wrote in one of his works: 'Beijing is a capital city with the largest number of ancient trees in the world. There are especially numerous cypresses with twisted roots and gnarled branches planted from the Liao (916–1125), Jin (1115–1234), Yuan (1271–1368), and Ming (1368–1644) dynasties. They have gone through the vicissitudes of the ages and are still growing luxuriantly, forming a unique feature of the capital city.'

Other research emerging from tropical countries, such as Vietnam, has extended our understanding of ancient trees in the tropical rainforest, where only two decades ago it was believed that there would be little chance of finding any ancient trees at all. It has been discovered that seasonal monsoon rains cause the laying down of identifiable growth rings in a number of tropical tree species in South East Asia. Tree ring samples taken from *Fokienia hodginsii* trees in Bidoup-Nui Ba National Park near Da Lat, Vietnam, to help with climate studies at Columbia University's Lamont-Doherty Earth Observatory (LDEO) Tree Ring Laboratory, have been discovered to stretch as far back as the year 1029. There may be thousands of ancient trees waiting to be discovered in the rainforests of the world.

What we can say with certainty is that the world's most ancient trees occur in a wide variety of environments around the world, from the temperate climates of Britain and New Zealand to the intense tropical heat of the Amazon rainforest. For some tree species, such as the bristlecone pine, harsh environmental conditions (such as intense cold, high altitude and drought) actually seem to encourage the attainment of great age.

We have also observed that trees can reach ages of over 1,000 years in a variety of ways. In some instances this appears to be related to local environmental conditions; in others it is, fascinatingly, due directly to the intervention of humans. Trees in this category include the olive (*Olea europaea*), sweet chestnut (*Castanea sativa*), oaks (*Quercus* spp.) and limes (*Tilia* spp.), which have regularly been coppiced or pollarded over long periods of time.

For many tree experts and conservationists it is not the actual age of a tree that is of interest, but the process of becoming ancient. The features generally associated with a tree being ancient (for example in an oak or a chestnut) include a wide and hollowing trunk, the presence of epiphytes such as fungi, mosses and lichens, and

a lessening of the canopy with dead wood within it, as well as dead wood on the ground. Contrary to widely held belief, these features are not a sign that the tree is about to die, and trees in this condition can remain alive and healthy for many decades, even centuries. These characteristics are all synonymous with being ancient, but because trees grow in a wide variety of environments, they can arrive at this stage at widely differing ages. The more ancient features a tree displays, the more valuable it becomes. This is because the hollows, dead wood and increasing numbers of epiphytes provide habitats for wildlife – some of it very rare. Even after its death, an ancient tree continues to provide habitats for wildlife for decades more. Ted Green, of the Ancient Tree Forum, often points out a dead tree and says 'How can that be a dead tree? It's still full of life.'

Fascinating though this debate is, this book is not designed to identify the world's oldest individual tree or to be a definitive guide to all the world's ancient trees. Rather, it is a celebration of certain tree species and groups of trees containing individuals that are at least 1,000 years old.

Objects of respect

Since the earliest times, trees have held a special fascination for humankind. Across large areas of the world where now only scattered remnants remain, vast forests once stretched unbroken. These forests, the original wildwoods, provided our ancestors with shelter and food, medicines and other necessities, but many of the trees also represented something more. It is not difficult to imagine how, with their huge trunks reaching upwards from the earth and their branches seeming to touch the sky, some of the world's giant and most ancient trees – whose lifespans far exceeded those of human beings – must have seemed immortal and come to occupy a special place within the greater scheme of things; to appear connected with the forces governing the Earth, and to be able to directly influence peoples' lives.

Around the world, many large and slow-growing individual trees have been – and still are for many people today – the objects of deep respect and often a religious reverence, making them sacred and setting them apart from other trees. Such feelings appear to have distinguished one of the most long-living (if not indeed the longest living) of Europe's tree species, the common yew, in the distant past. This tree's mysterious ability to continue to renew itself from a state of apparent decay, and its deadly poisonous but evergreen leaves, helped to confer upon it the status of immortality and place it at the centre of a sacred cult associated with the afterlife. The most common signs of this remain in evidence today in the wealth of ancient yews that still create a deeply mystical aura in churchyards throughout northern Europe.

The great European oaks (***Quercus robur*** and ***Q. petraea***) and the limes (chiefly ***Tilia cordata*** and ***T. platyphyllos***) also came to acquire a sacred status of their

own – the oaks being associated with the Norse and Germanic gods of thunder and lightning, and the limes with fertility. Sacrifices were made to the powerful supernatural beings associated with these trees, in the hope of influencing the lives of people on Earth. The Celts are a well-known example of a European people whose lives were dominated by trees and the forces they were believed to represent. Describing their tendency to create sacred groves or sanctuaries in forest clearings or glades, the Roman historian Gaius Cornelius Tacitus (AD *c.*55–120) wrote of the Celts living beyond the Roman Empire:

'They deem it incompatible with the majesty of the heavenly host to confine the gods within walls, or to mould them into any likeness of the human face; they consecrate groves and coppices, and they give the divine names to that mysterious something which is visible only to the eyes of faith.'

Such beliefs in the sacred powers or mystical forces of trees are still strongly present in many urban societies today, and are only superficially hidden from view. The familiar Western good-luck charm of 'touching wood' is, for example, according to Jacqueline Memory Paterson, the author of Tree Wisdom, 'a direct continuation of the actions of our Celtic ancestors, who at times of need went to certain trees and touched and communed with them. These trees were thought to contain or house specific spirits, such as those associated with the elements and gods and goddesses.' To many of the world's ethnic groups today which have been able to maintain their cultural traditions (at least in part), trees continue to provide both a practical and a spiritual focus for their lives. One such example is that of the Pehuenche Indians of south-central Chile, whose name and identity have been determined by the monkey puzzle trees (*Araucaria araucana*) among which they have traditionally lived. '*Pehuenche*' means 'people of the monkey puzzle tree', for the tree is sacred to them, and the diet of some communities is still based upon the nutritious seeds produced by the trees. The trees are able to live for an estimated 2,000 years, and once covered a much larger area of the southern

ABOVE LEFT
The bristlecone pine is the world's oldest verifiable tree. One individual has more than 4,600 annual tree rings.

ABOVE CENTRE
Research from the tropics has indicated that rainforest trees may live for much longer than previously thought, with thousand-year-old trees being found in the Amazon region and south-east Asia.

ABOVE RIGHT
Ancient trees, such as this yew in Wales, have been venerated by people all over the world for millennia.

hemisphere. The Pehuenche have been battling for years to save their ancestral forests from international logging concerns, but with only limited success.

On the North American continent, the continued commercial felling of Douglas firs (*Pseudotsuga menziesii*) – some of which were taller than the coast redwoods (*Sequoia sempervirens*) and possibly older than the giant redwoods (*Sequoiadendron giganteum*) – has been the cause of much public concern. This is also true of the continued felling of the coast redwoods, although now only 18 per cent of the remaining forest area falls outside some sort of protection. In the tropics it is now understood that there are almost certainly trees over 1,000 years old that are yet to be discovered, but many of these will disappear because of deforestation. In Europe, the cessation of traditional management systems such as pollarding and coppicing may lead to the early demise of many great trees. In addition, problems now being caused by global warming, in particular drought as well as diseases and pests, threaten forests and trees across the globe.

However, the traditional reverence that has characterized the relationship of entire peoples with certain trees continues to offer these trees some protection. In India, for example, the banyan fig (*Ficus benghalensis*) is protected not only because it has long been considered a sacred tree, but because its shade is greatly valued. Strict regulations control the usage or treatment of banyans for religious and practical reasons; some trees, situated along routes regularly traversed by people on elephants, are reserved for fodder. Similar beliefs are held about the bo tree (*Ficus religiosa*), the sacred fig of India, Sri Lanka and parts of South East Asia, and about the remarkable ginkgo (*Ginkgo biloba*) in China and Korea, which, although almost extinct in the wild, continues to thrive in temple gardens, where it was traditionally planted by Buddhist and other monks.

The remarkable secular uses to which people around the world have put their age-old trees are well illustrated by the baobab and boab trees of Africa and Australia. Here, the hollow trunks of ancient trees have been variously used as prisons, storerooms, lavatories and even pubs. Despite such usage and the fact it cannot be beneficial to their longevity, the trees have been able to survive.

Literary and artistic inspiration

Ancient trees have been a constant source of inspiration to poets, artists and storytellers throughout the ages. William Wordsworth (1770–1850) drew inspiration from ancient yew trees in 'The Pride of Lorton Vale' and refers to the 'fraternal Four of Borrowdale'. For Vincent Van Gogh (1853–90), the subtleties of colour and texture of the olive trees of Provence inspired and drove him to distraction in almost equal measure. Thomas Jefferson (1743–1826) was inspired to write: 'The olive tree is surely the richest gift from heaven', while Aldous Huxley (1894–1963) recorded his feelings as follows: 'I like them all, but especially the olive. For what it symbolizes, first of all – peace with its leaves and joy with its golden oil.' And William Blake's passion for trees was summed up in one of his works, published in 1799, which read:

'The tree that moves some to tears of joy is in the eyes of others only a green thing that stands in the way. Some see Nature all Ridicule and Deformity … and some scarce see Nature at all. But to the eyes of the Man of Imagination, Nature is Imagination itself.'

Ancient trees are precious. There is little else on Earth that plays host to such a rich community of life within a single organism.

SIR DAVID ATTENBOROUGH

Saving our ancient living heritage

Whatever the experts may decide about the exact ages of our oldest trees, a resurgence of interest in saving and appreciating our ancient living heritage has become apparent among people from all walks of life. Ordinary people all over the world, from Chile to Bhutan, are now fighting to save their forests. On an international level, organizations such as WWF are continuing to campaign to protect and better manage our forests worldwide by addressing the many threats they face, not only from the forest-products sector, but also from agriculture, mining, road systems and settlements. WWF also advocates the target of 'ZNDD' (zero net deforestation and degradation) by 2020 in response to the urgent need to tackle the threats to both forests and our global climate.

Since this book was first published more than a decade ago, the understanding of and interest in our global ancient tree heritage has grown hugely. Today, there are numerous individuals and organizations all over the world looking for, and campaigning to protect, ancient trees. In the USA, Save the Redwoods League is just one of a number of organizations campaigning for the better protection of America's ancient trees. In China, the University of Hunan has already recorded over 100,000 ancient trees growing in that province alone. In the UK, Europe's largest and most comprehensive public/scientific ancient tree project – the Woodland Trust's Ancient Tree Hunt – had recorded over 100,000 notable trees by the end of 2011. And in tropical South East Asia the ring sequences of old trees are now being recorded, revealing some unexpectedly ancient trees in monsoon countries such as Vietnam – some have been found to have more than 1,000 annual rings. These ring sequences are being studied in order to help our understanding of climatic events in the past.

We are, in many ways, rediscovering our common link with our ancestors through a new respect and reverence for forests and, in particular, for venerable old trees. In a world increasingly dominated by change, these trees provide a tangible link with our past, serving to remind us of the extraordinary antiquity and beauty of life on Earth. This book is intended to be a celebration of some of the world's most ancient trees.