Ancient Trees - Growing Downwards

An ageing strategy for survival and longevity – a non-arborists view.

They say:

An oak tree grows for 300 years
Rests for 300 years and
Then spends the next 300 years gracefully expiring

The tree 'observer' best called 'anon' that wrote this wonderful quote, perhaps several centuries ago, could be considered as our first arborist. Others might argue that 'anon' should rate amongst the great tree observers of the 20th Century such as Mattheck, Pearson and Shigo (there might be others but these are the ones my arb associates quote most frequently).

Being a non arborist but now spending a large proportion of my time in their company has perhaps given me a unique position in the development of arboriculture in the UK in recent times. Whilst for the last 16 years I have worked as a non arborist amongst very old beech trees over 250 years old and large numbers of oak trees over 400 years old running up to a few that might exceed 1000 years old. While I was assessing them biologically and recording them and knowing absolutely nothing about arboriculture, the questions that I pondered might well have been those of a 7 year old. Basic simple questions such as: what was happening and what had happened to produce these ancient old trees? How had it happened over such a great period of time? What were the causes that brought this longevity? Were there any special factors, reasons or man made or natural events that contribute to longevity?

Standing under, what was to my uneducated eye an exceptionally healthy ancient oak tree, one has to ask how a tree survives the rigours and variations of weather for up to 1000 years and still has a beautiful full leaved crown that produces acorns. Britain regularly has high winds including exceptional gale force winds about every 80 years and hurricane force approximately every 200 years.

As I became aware of arboriculture, I began to realise that in recent times arborist's views of trees have been advanced considerably by at least three individuals that I have come to know: Alex Shigo, Claus Mattheck, Alan Rayner and not forgetting xxxxx Pearson who also commanded great respect from arbs. However, I then began to wonder where arboriculture would be today if Alex Shigo, Claus Mattheck and Alan Rayner had spent their formative thinking years wandering amongst the aging veterans at Windsor many of which are allowed unmanaged to go through their natural aging process and so lacking across the rest of continental Europe?

Wandering among these ancient trees today, Claus Mattheck would presumably focus on shape and structure as the dominating factors. These ancients with their short squat form are very resistant to failure in frequent high winds because of the ratio of trunk diameter to height. As the trunk is completely hollow it is presumably more supple. When the tree finally gets to this state, presumably every additional annual growth ring laid down is more adapted to accommodate movement. Providing that the trunk is within Claus's formulae of ratio of living wood to hollow diameter and height over diameter, the tree becomes more resistant to failure in high winds. Being hollow the roots have only a fraction of the weight of a solid

trunk to support and again this would make the tree more resistant to failure. One might remark that their shape is reminiscent of a traffic cone not forgetting though that the tree shape came first.

On the other hand Alex Shigo might look at the open grown form of the tree. He might comment that it has always been growing in isolation out in the open. Its large spreading crown has had time to develop free of competition and has been able from the very outset to capitalise on its optimum light gathering power. This has the advantage that the tree can maximise on the energy or food from sunlight and carbon dioxide throughout its life. The squat short form means it has never had to struggle with neighbours to compete for light in a closed canopy and has therefore grown outwards instead of upwards. Being open grown presumably means little or no competition for the root system and in association with essential and fundamental co-evolutionary mycorrhizal fungi it has a greater area for gathering minerals, nutrients and water without competition. It may be reasonable to assume that the low maximum height means the tree takes far less effort in moving its fluids from the roots to its top most extremities - a truly efficient tree form.

The interior cavity of a hollow tree would also be interesting. It contains large amounts decomposed heartwood and as it decays, provides at the base of the tree, minerals and nutrients which are made available again to the tree (previously locked up in the heartwood/ ripe wood). Another strategy is putting out aerial roots, often from as much as four metres up in the hollow tree down into the base, which literally tap straight into this mineral and nutrient rich mulch. A hollow tree with its numerous holes, ledges and crevices becomes a vast tenement block – a home to bats, other animals, many bird species and multitudes of insects. All of which down the centuries will bring other minerals and nutrients in one form or another. What a fantastic strategy? With age and a declining ability to literally recycle yourself, to accumulate essential food and water as you hollow and then the hollow cavity gives you another advantage by providing homes for others to bring in further sources of food! The ultimate in recycling.

Alan Rayner, as a mycologist, might argue that if hollowing is considered in most instances beneficial to the tree, then perhaps fungal decay of the heartwood/ripewood should not be termed fungal attack or a disease. Instead a positive term such as fungal recycling of deadwood (heartwood/ripewood) should be used. After all the term fungal attack or the fungal degradation of wood must have originated in forestry and by users of timber who wanted ‘sound’ wood. In commercial terms hollowing and old trees were seen as useless and taking up space. Needless to say it is the foresters straight ‘sound’ ‘healthy’ trees that blow down in gales and the hollow or old ‘dangerous’ trees withstand gale after gale. He would almost certainly comment that where there was no demand for fallen wood, when a tree shed a limb, the wood would remain under the tree above its own roots, to decompose naturally at its own rate. The mineral and nutrients gradually released by the decomposing fungi and bacteria (the recyclers) and invertebrates would be picked up by the mycorrhizal fungi and transferred back to the tree. Nothing lost –from tree back to tree in an endless cycle. This endless natural cycle means healthy. In return for providing recyclers and the food gatherers with their requirements from the dead wood and leaf litter, they provide the tree root system with an unbroken, first line of defence against pathogens - nature’s biological control. An old tree is a source of these essential organisms that can transfer and colonise further generations of trees that grow in the nearby surroundings.

So what other features might their trained experienced eyes have found amongst these ancient trees? Alex might remark on their ‘stag headed’ appearance. In other words dead limbs, often quite large, which died in some drastic natural crown reduction that could have happened centuries ago? They become

seasoned, bleached and fossilised and will remain on the tree only to fall when the whole tree finally succumbs itself. These limbs often point skywards, extending out through the existing living canopy for as much as 3 metres. There is also evidence from old woodcarvings and engravings of known old trees from at least 200 years ago showing the same dead limbs with a very similarly shaped crown. Looking at the crown Alex might see further evidence of crown reduction or retrenchment and perhaps evidence of its occurrence several times in the trees life. Would this lead him to think about the tree's ability to 'grow downwards' and to explore the pros and cons of arborists mimicking the natural crown reduction rather than crown thinning. And perhaps to argue why it is necessary to 'deadwood' an oak and destroy its beautiful natural aesthetic appearance.

Alex's would certainly have turned to look at ancient 'working' trees. These trees are evidence of a past system when the majority of trees, certainly those near habitation, were used for some purpose or another. It involved the cutting of limbs or twigs on a rotation but never felling of the whole tree. These trees that were made to work were cut in various ways to produce different types and forms and were called pollards, shreds and coppice. In Britain today there is a fascination amongst arborists about when they were cut (times of year), why they were cut (what uses and purposes for the cut wood), how they were cut (where on the tree and the tools used), the interval between cutting (rotation), and whether they removed all the limbs and cut less every rotation as the tree aged. This continues to be a major debate and no doubt Alex would never resist the temptation to join in. An in depth study on how different species of tree respond to the different methods and timing of cutting across the various climatic zones of Europe might throw up some interesting results. Alan would almost certainly want to jump in and exclaim "who persuaded arborists to cut right back to the branch collar? Why on earth aren't we leaving substantial stub ends when cutting limbs now that we are beginning to understand the roles of co-evolutionary latent fungi within the tree? After all beavers evolved to work with trees and coppice and always leave stub ends."

The centuries old, vast buttress roots spreading out in different directions to anchor the tree in high winds and their position around the tree might provide a great deal of information for Claus about the old trees response to wind direction. Some of the hollow trees have a section of the outer trunk decayed away presumably after one of the frequent lightening strikes these trees have suffered. The trees in cross section resemble a horseshoe. They appear not to have lost any of their resilience to withstand high winds and as Neville Fay points out this is the strongest natural structure known to man. Some of these trees might have aerial roots which in many cases providing the tree with added support as a supplementary young trunk as they are growing older and larger. A large number of trees have suffered a proportion of limb failures in their lives. Presumably the limbs in the middle and upper canopy have failed from late snow, ice storms, or high winds coming from a very unusual direction. While not forgetting summer branch drop which I am told is more common in periods of dry weather. The real interest therefore might be the failure of the larger limbs. Many of these limbs have been able to grow outwards at an angle near to the horizontal unrestricted throughout their life span and can attain a length of up to 16 metres. These would have provided Claus with a host of excellent natural examples and variations of hazard beams, supporting ribs, stress fractures and compression and tension bark formations for his cartoons. In one or two cases the limb over time may have lowered and eventually rested on the ground at some distance from the trunk and then layered. Then the limb has taken root and eventually the growth emerging becomes a separate tree. One has to ask "why fight nature and cable brace in an attempt to keep the tree in its perceived perfect form when the tree is trying to follow its own life forces to grow down gracefully. Why not just manage the tree accordingly for its more likely to prolong the life of the tree. "

Ted Green, 08/11/09

Almost certainly the varying amounts of decay, the areas of dead dysfunctional trunk and the degree of hollowing would arouse Alan's interest. As well as all the trees that have repeatedly been subjected to numerous so called 'attacks' by fungi down the centuries and yet have recovered time and time again and survived. He would surely argue that as the action of fungi in decay areas of wood on living trees can be beneficial, surely we should use more positive phrases such as fungal colonisation and stop thinking of this natural co-evolutionary situation in negative terms? These fungi have evolved with the tree and many species really never die they simply pass from one tree to another. They carry out what we might see as essential roles for their mutual survival. He might remark that the tree has its own in built arborists - walling off dead limbs in the canopy that become inefficient photo synthesisers. The limbs are then decomposed in situ by latent fungi, already present in the limbs in a passive state, awaiting the death of the limbs to start the process of essential decomposition - natural aerial pruning.

This article touches only briefly upon a few aspects of the ageing process because many of them warrant an individual article by a scientist or professional arborist. However it does illustrate that trees in a temperate climate can reach exceptional ages in spite of so called fungal 'degradation' of the heartwood/ ripewood. It is also clear that they can survive the loss of large and small limbs in bad weather, which is part of the growing downwards process. In both cases the decomposition of the heartwood and the decomposition of any fallen limbs would contribute greatly to the natural fertilisation of the tree. This in turn might give the tree's roots renewed vigour. This natural process is usually interrupted and interfered with in our modern day trees.

In Britain today you can still find many groups of ancient trees scattered across the countryside sculptured, gnarled and beautifully misshapen by the rigours of centuries of the British climate. They, together with the ancient working trees in the rest of Europe and Britain, are just as much part of our cultural heritage as our ancient buildings, monuments, and our art treasures which we all value. The continuing threats to the flooding of Venice, for example, are recognised internationally to have become the responsibility of the whole of Europe so why not our ancient trees. Our ancestors learnt how to cut them, manage and use our trees. Centuries on perhaps we can still learn from them. Why not let the trees tell us and perhaps today the lovely quote by 'anon' should read instead of 'gracefully declining' should read 'growing downwards'.

Ted Green, 08/11/09