

TURIN TALKS TREES

A recap on the 2014 ISA European Arboricultural Conference in Turin, Italy, reviewing the latest on biomechanical assessment, root work and more.



Sections of the old wall have collapsed, narrowing the fulcrum at the base of the lever arm, but response growth is significant.

The theme of this conference was arborists building bridges to other professions, like manufacturers, nurserymen, urban foresters, and landscape architects. Arborists + Researchers = Healthier Trees, according to ISA, according to executive Jim Skiera. But we all know that's easier said than done. To make that dream come true, Skiera pointed to the need for arborists to stay involved in documenting good practice and maintaining communication between professions.

This need was highlighted by the next speaker on the pre-program, representing the local association of landscape architects. His appreciation of arborists centred on his unfortunate impression that older trees are more difficult and expensive to manage, so the arborist's principal role is to remove them safely and efficiently. When this job is done, landscape architects can then specify newer trees, properly selected and installed, to grow up and replace the contributions from the older trees that are lost. But we all know

this is not such a simple matter.

Take a short stroll from the conference centre down to the Po River and you will enter Valentino Park, Turin's largest park. Surrounding the marvellous statuary and fine public facilities for physical fitness and the arts is a landscape with many large, healthy, well-managed trees. In many open spaces you will see dozens of young trees with trunks properly staked and protected and many have well-structured branches. At first glance, these young trees appear able to grow in size and ecosystem services, so they will provide a return on the investment—typically after age 20—and deliver an increasing profit for decades, even centuries. But look down, and you may see conditions that suggest differently. The same deep planting and root girdling common around the world is all too evident in Italy, boding ill for tomorrow's canopy.

In his keynote presentation, **Kark Niklas** started his presentation titled "What We Don't Know about Tree Biomechanics" by admitting the truth:

conclusions from research into the science of mechanics are severely limited by simplifications and assumptions. Try applying this research to living, responding systems such as trees, and you will find what Niklas calls "very large gaps in our knowledge regarding the mechanical behaviour of trees." These limitations are so great that tree assessments must rely more on the tree's body language—the swear words and also the songs!

For instance, the general belief that tree root systems are broad and shallow is often not true. Tree species, soil type, and movement can initiate roots that grow downward. These are "bayonet roots" or "grappling hooks", in Niklas' estimation, but they are discounted due to their locations. The anchoring effect of these sinker roots, added to the "guy wires" in roots near the surface, substantially reduces the risk of uprooting. We don't often see downward roots because such trees seldom flip over for us to examine!

He then portrayed a redwood tree that had an opening carved in its base to build a road through it, yet it has survived without incident (or visible decay) for decades. When trees shed their heartwood naturally, as they often do, Niklas reminded us that the tubes are very strong structures. Hollowing increases flexibility, sheds waste products and weight, and can decrease the likelihood of shear cracks forming when the trunk twists in the wind. After decades of hearing questionable conclusions about risk based on invasive measuring of stem wall thickness, these reminders were refreshing.

Dr Niklas developed this concept further, noting the usefulness of installing brace rods into hollow trunks when shear cracks might form because their walls get extremely thin. He compared this structural strengthening to adding struts in an airplane, or creating 'many tin cans instead

of one tin can. Such visual analogies, quick responses to the thoughts of others, and a warm sense of humour make Dr Niklas an effective teacher, and his frank acknowledgement of the limitations of research communicated honestly as well. Using a simple diagram of a round crown atop a cylindrical stem, he demonstrated that stabilisation via the trunk flare is often not factored in. Also, assuming homogeneity in wood density ignores the constant adaptation of living tissues to stimuli like movement, compression, hormonal activity, and electrochemical signals. All wood is reaction wood, as other researchers have reminded us before. Unlike pipes and airplanes, biology drives the mechanics in tree biomechanics.

Jeremy Barrell, a leading consultant in the United Kingdom, exposed the fatal gap between the rules and guidelines in tree assessment procedures, and the reality of the practice in the field. Using effective before-and-after images of heritage trees, he showed that 30cm cuts on the central



Despite the wall crumbling around it, this veteran tree stands tall, sheltering the historic building which now houses a laboratory.

leader (the UK definition of 'topping') can be defensible, when the only other option is losing the tree. Observing reiteration and adaptation over the years, Barrell documents 'topped' trees managed effectively, indefinitely, at low expense.

These examples were a refreshing contrast to the "Remove and Replace" recommendation routinely offered in the US. When the arboricultural going gets tough, the arborist moves beyond rules of thumb, and gives trees a hand.

Many talks in Turin showed multiple steps, tables, charts and matrices designed to help guide the assessment of valuable individual trees. These systems have their good points, but take too much time for populations of trees, Barrell notes. Quantitative assessments are hard to apply—understanding likelihood is impossible and emphasis on size is misleading. People are soft, and branches are hard, so small ones can cause bad injuries. Classical risk formulae do not apply to trees. Due to trees' myriad variability, assigning specific levels of risk does not work.

There's a failure to translate these systems into procedures for users; what to cut, what to keep. Arborists are overwhelmed. At Althorp House, Princess Diana's final resting place, trees are inspected for risk not annually or monthly, but daily. A mature oak on the grounds had only a slight amount of decay, but it was removed, and with it, all of its value and contributions. The arborists had very



Above the subterranean conference centre stands an *Aesculus hippocastanum*, Tree #1 on the city's inventory.

low risk tolerance, mirroring systems being taught today.

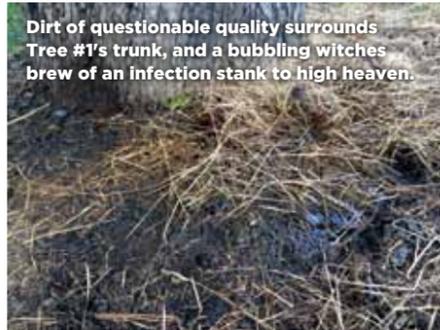
Glimpsing the Laman Street Ficus Fiasco, Barrell wondered what would have happened if tree value was thoroughly documented and pruning and other more conservative means of mitigation were carefully specified. When confronted with high-stress assessments, Barrell advised to step back and take a reality check. Don't beat your head against the wall—walk out the door, take a deep breath. Taste the air oxygenated by trees and get a fresh perspective. Experience in the courtroom tells Barrell that it all boils down to two questions: Is failure truly foreseeable? What would a reasonable person do? Four steps are essential:

1. Identify factors that might cause a failure (one could start with looking at what holds the tree up)
2. Establish occupancy. Are people likely to be present during the type of weather events that are likely to cause failure? (usually, not likely at all)

3. Weigh each of the risk factors (good and bad)
4. Specify actions to reasonably address each risk factor

A cypress tree planted by the Duke of Wellington was pruned by Barrell himself in 1989. By 2014 it was due for pruning again, but instead a risk assessment was ordered. None of the assessors wrote pruning specifications, so confusion reigned over how the tree would look if it was pruned enough to mitigate the risk. Politics and aesthetics had no guidance from arborists. Abysmal risk tolerance carried the day. The Duke's healthy tree was felled. Chainsaws revealed that decay and risk was grossly exaggerated during the use of technology. Barrell's video on the travesty spurred needed change in the top-down administration.

Barrell's recent work on 'TreeAH', Tree Assessment for Heritage, emphasises visual importance in place of the biology and ecology at the core of established



Veteran Tree Network training. It also lacks VETree's specification of treatments, the communication bridges with the field worker and the owner, but the examples at the end of TreeAH demonstrate comprehensive and non-defensive assessments.

Recommending treatments without proper diagnosis is professional malpractice. Misguided arborists are currently the biggest part of the tree risk problem. By inspecting trees competently and specifying care—without offering

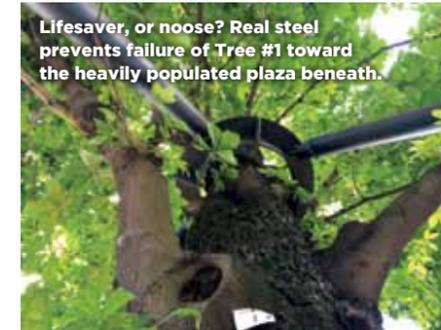
opinions—arborists can easily become the biggest part of the solution. It's up to us to choose to manage trees, or else we will be managed by the fears of our clients and employers, manipulated by forces beyond our control.

Brian Craig of the UK presented data 19 years later on roots trenched for a communication line. This 30-plus centimetre deep trench was about 30cm away from 58 trees that were 30cm calliper at the time. Most are still there and all of these survivors appear to be in good condition. **Tom Smiley** from the US presented results from pulling tests on 6cm trees, which concluded trees with roots cut at a distance three times the trunk diameter or closer should be considered for removal. This guideline is based on a mere 1 per cent deflection on a pull test, but it is still extrapolated to judge large, established trees. Despite the experience in the UK and elsewhere, this ratio is the standard in the ANSI A300. The UK trees were cut at one

times the trunk diameter, but no one considered removal. Why this difference in risk tolerance? As Barrell and Niklas noted, formulas don't always apply due to their limitations.

We can apply direct experience related by **Luigi Strazzabosco**, Ph.D., municipal arborist for the City of Padua. His thesis involved not only soil replacement around the stems of veteran trees, but stimulating flushes of adventitious lateral roots by prescribed wounding of the exposed roots. Replicating this phenomenon in the laboratory, he learnt that the regeneration of a secondary root structure is a sustainable practice and does not reduce biomechanical safety. This retrenchment of the root system mirrors the retrenchment of the branch system by wounding with a handsaw. But it is invasive, and requires a careful management plan. A more thorough evaluation of this work is upcoming.

The conference concluded with a quick example of using the Tree Risk



Assessment Qualification (TRAQ) system. The first exercise was on a leaning cypress tree. Diagnosis was incomplete and a victim of vague terminology; a long but narrow mechanical wound facing the street was described as a 'canker defect' despite no sign of infection and impressive ribs of woundwood. After targets and conditions were systematically assessed, no consideration was given to pruning or supporting. Mitigation options do not appear until the end of the TRAQ form, when assessors

are likely to be mentally fatigued.

A local team of Turin arborists rated likelihood of failure not as improbable, where most trees fit, but 'possible'. According to the TRAQ form, this 'possible' means that the overall risk can be no lower than 'moderate'. They also referred to the tree's lack of monumental or heritage status, saying "We have lots of trees like these". Another group rated likelihood of failure improbable so the tree low risk. The QTRA method, according to its developer Mike Ellison, also rated it low. Interestingly, a seasoned European arborist stretched to push the tree up into the yellow (moderate) range, playfully skewing the matrices to fit his gut feeling from the scar and the lean. Pruning was an obvious option, but mitigation, like diagnosis, was lacking in the exercise.

By attending this conference, I learnt a lot more that we arborists do not know about tree biomechanics. More than ever, it's time to go beyond formulas and observe, treat, and trust the tree. **AA**