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# DETECTIVE DENDRO THE DIAGNOSTIC SLEUTH

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By Guy Meilleur

## The Case of the Lonely, Lashing Leader

After a week of witnessing pull tests and dissecting brush, Codit and I were aching to study the biomechanics of a standing, living tree. We got permission to visit the state champion red oak (*Quercus rubra*), which was cared for by our buddy, Jan Honeyman. The owner wanted it remeasured and nominated for the U.S. National Register of Big Trees. Jan also invited our old friends from Hong Kong, soil expert Ru Trundiep, and his aerial assistant, Clai Minghai, along with two European colleagues. We all loaded our everyday gear, so we were ready for soil assessment, root measurement, climbing, tomography, resistance drilling, and sounding. The drive out to the tree was charged with anticipation. We parked along the street and started unloading the gear while Jan met with the owner. Just then, a man approached us from the property next door.

“So you’re the tree crew, huh?” He hooked his thumbs under his belt and spat to the side. “It’s about time that monster got removed. It’s a ticking time bomb.”

Codit cupped his hands behind his oversized ears and leaned toward the backyard, where the huge tree stood. His face squinted in silent concentration, but he shook his head. “I can’t hear the ticking from here, sir. I’ll listen again when I get closer.”

The rest of us tried to keep from laughing as we promptly proceeded to the tree. The neighbor struggled to reply, but walked away after he saw the tree’s owner approaching from the back garden.

“Good morning,” she greeted us. “I’m Edith Robalanus, and I’m so glad you could come this early—I have to leave in four hours. We’re proud of our state champion, and can’t wait to see how it measures up nationally.” Her voice dropped as she glanced next door. “My neighbors are getting old and worrying about things that did not bother them before—such as my tree! Can you please write up a report that might mitigate their fears?”

“Yes we can,” I assured her. “We’ll work for two hours on this advanced assessment. After lunch, we’ll let you know if further work is needed.”

I wrote down the proposal and handed it to her with proof of insurance. She gave it a quick look, signed it, and

went back to her gardening. Clai helped Codit with the pre-climb assessment, and ascended to check the eleven heavy cables that held the crown together. Ru and I used the long measuring tape to confirm the average crown spread, then sent it up to Codit, to drop from the summit. The rest of the team fastened twenty-four sensors to the gigantic



The assessment crew gathers under the champion red oak (*Quercus rubra*) for a pre-job briefing to review their assignments.



At the flare, bright black droplets embellish a buttress, while the sinus shows a dull brown appearance, partially obscured by greenery.

trunk. Time flew by as we assessed the tree's parts, double-checking our data and cross-checking our opinions.

Clai hit the ground with a tap of his toes, with Codit right behind him. "Hey Dendro, what did you think of the panoramic pics I sent from the peak?" he asked, flipping his cambium saver over a tight fork.

"They came through nicely." I untied his stopper knot and pulled his rope out of the leather tube. "I like the way you copied the rest of the team and the owner on the email. Now, let's add the information to the nomination form, and the assessment form."

"Okay, I'm on it." he replied as he pulled his clipboard out of his pack and leaned back on the massive trunk. "I'll listen to my voice recording and review the pictures."



A conk above a small cavity arouses interest, but not panic. The arrow on the left points to a rib of rapidly-growing tissue that ends in a bulge at the wound. The arrow on the right indicates the fungus weakening where it hits that Wall 4.

"Good work!" I encouraged him. "Take the time you need." I walked around to the other side of the 9-foot (2.74 m) diameter trunk to check on the tomography team.

The guy with the laptop spoke first. "The tomograph sensed good conductivity in the roots to the east, where the invigoration work was done two years ago."

Ru brought my attention to the white root hairs in his soil probe. "We recommend similar operations on the rest of the root zone. The tomograph also indicates a large central hollow in the trunk—or trunks!—as it appears that multiple trunks may have fused over time, and may now be in danger of coming apart at these seams." He pointed to three points around a big purple splotch in the image. "These three areas also sounded hollow to the mallet. They were selected for resistance drilling, which showed wood thickness of 3–6 inches (8–15 cm)."

"That's not a lot for a 108 -inch (274 cm) wide trunk, is it?" I wondered. "It's hard to know for sure. There is limited scientific guidance on minimum wood thickness, and none for trees over 36 inches (91 cm) DBH. Trees are not pipes, so engineering formulas do not always apply." Just then, Codit walked around and leaned in to look at the laptop. His eyes bugged out as he pointed to the purple on the screen. "Never mind that Rorschach blotch, young man. Just share your assessment with us, if you're ready."

"Okay, Dendro," Codit said, leading us to the other side of the trunk. "As you talked to the client, I noticed big roots at the surface, near the garden path. Here at the flare, the trunk broadens to form buttress roots. Are those black droplets fresh paint or something? They look so shiny. To the right of the droplets is a flat, brownish, scuffed-looking area. What caused that? And what about that plant growing up next to it—is it good to keep or not?"

"To realize that you do not understand, is a virtue," Ru noted, quoting the Tao Te Ching.

I nodded as I pulled a chisel out of my bag. "Those black droplets are coming out of 'bleeding lesions.' It looks like a soil-borne organism, such as *Phytophthora* sp., is colonizing the phloem tissues under the bark. These lesions are a structural concern, because we already know that interior decay is near the surface. This pest should be managed with IPM treatments aimed at compartmentalization." I flipped through pages 354–367 of my book on diseases. "Remove soil from stem tissue, dry the area, deeply aerate nearby soil, clean and heat the lesions, and amend the soil with calcium fertilizer and beneficial microorganisms to help speed compartmentalization."

I peered over the book. "As for the brown, scuffed-looking area, I have seen that condition several times before, but do not know its cause. The plant is *Euonymus fortunei*, an ornamental groundcover that might be called exotic, but is not invasive here. Groundcovers can be good tree associates, but not on the flare. We'll specify carefully pulling the groundcover out by the roots, and relocating it to the dripline. This will encourage Mrs. Robalanus to apply water away from the trunk. We'll also



recommend mitigating erosion by planting a bed of native wildflowers and mulching between those exposed roots. This would complement the client's garden, while expanding biodiversity and improving tree health."

Codit pointed higher on the stem. "These old fungal conks resemble a species of *Phellinus*. What do you make of them, and the tree's response?"

"*Phellinus* in oak is often confined to sapwood, and slow-growing. The response growth to the left, with the orange tissue, is compartmentalization." I pulled out my book on fungal strategies, and read from page 96: 'Amazingly, the tension-wood fibers in oak wood exhibit hardly any structural changes, even at the late stage of decay with *Phellinus robustus*.' With no other conks in evidence, it does not appear that we are dealing with an aggressive wood decay fungus."

Codit held up his smartphone screen. "What a crop of acorns! Does the tree know it's about to die, so it's in a hurry to reproduce? How much loading do these acorns add? And if the tree is pruned next spring, how will the tree respond?"

"Judging by that beautiful foliage, the tree's got high vitality," I said. "Those green acorns add a lot to the loading. Red oaks are known to be 'alternate bearing,' with a heavy crop one year and a lighter crop the next. I'm not sure we are seeing signs of 'panic fruiting.'"

"This is a heavy crop year," Honeyman verified, "so the fruit load will be even lower next season, further reducing the likelihood of failure."



A bumper crop of acorns weighs down the tips. The small size of the 'sun leaves' is normal at the top of the tree.

"The diner downtown is famous for their squash-onion casserole. Let's work on the forms during lunch, then return to consider the middle of the tree, and the forks. The question is, can we complete this assignment in time?"

*Turn to page 42 to find out.*

## The Bonnie Appleton Memorial Fund

Anyone who met or worked with Bonnie Appleton quickly realized what an amazing person she was. She had a passion for her work in horticulture—especially arboriculture—and shared that enthusiasm with all who knew her. She was known internationally as an author of five major books, 30 industry journal papers, and more than 800 articles for newspapers and trade and consumer publications.

In honor of Bonnie and to remember her legacy, the ISA Mid-Atlantic Chapter and Trees Virginia have established the **Bonnie Appleton Memorial Fund**, with the TREE Fund, and are working to raise USD \$100,000 for their initial amount to endow an annual scholarship for college juniors or seniors in the green industry. The Bonnie Appleton Memorial Fund and Scholarship program will be a tribute and legacy for all of Bonnie's accomplishments. Funds collected so far have reached over \$30,000 (in 2013), but organizers still need to reach their goal of \$100,000 in 2014.

Bonnie was a facilitator who brought together arborists, horticulturalists, nursery personnel, and utility professionals to work collaboratively to solve industry issues.

The tree care industry will continue to benefit from all of her hard work. This scholarship will help support worthy students continuing in her footsteps to benefit the green industry.

Bonnie's work and research reached all chapters of ISA and its allied industry partners. Help spread her lasting memory by encouraging all who benefit from her work and research to support the Bonnie Appleton Memorial Fund.

Donations are accepted online through the TREE Fund website (<https://secure.qgiv.com/for/?key=treefund>). All donations are tax deductible.

For more information on Bonnie's life and accomplishments, please visit the website of the ISA Mid-Atlantic Chapter ([www.mac-isa.org](http://www.mac-isa.org)). A•N





## WHAT'S THE SOLUTION?

We returned from lunch refreshed and ready to reexamine the remarkable tree. Codit aimed his laser pointer and began. "Is the big pruning wound just to the left of this leader—a stem that dominates a portion of the crown by suppressing lateral branches—significant? Below the leader are horizontal wrinkles. On the base of the leader, these vertical plates are characteristic of the bark on this species. I know that bright orange color between bark plates is a sign of rapid response growth. Is that open white seam also good response growth?"

"Keen observations on the wrinkles and the seams!" I said. "They are indeed eloquent expressions in the tree's body language. Those wrinkles, or compression folds, are yellow flags. This leader may be sagging downward too much, too fast, indicating that reduction pruning is needed. We'll take a picture and save it for comparison

during future inspections. Above the folds, those orange areas are indeed beautiful signs of response growth, green flags waving to the future."

Ru gazed at this feature and said, "When people know beauty as beauty, then they can recognize ugliness."

I aimed my laser pointer and said, "The big ugly pruning wound indicates the recent removal of a big limb. This loss removed a lot of mass damping and stabilization. The removal cut also introduces drying and dysfunction to heartwood. Being on the north side, maybe the branch was declining due to shade. In any case, exposure to new loading contributed to this failure." I pointed the laser at the white seam. "The bark has split open. This exposed white wood is the ugliest sign of all. It indicates structural failure, a big red flag, and a hazard that should be acted on before the acorns form next season."

"That limb is cabled, yet it's moving too much?" Codit frowned. "The acorns are like metal balls tied to the thongs of a whip. This leader must be lonely, lashing out so fiercely. What can we do for it?"

"You mentioned one mitigation option before lunch," I replied. "Retrenchment pruning lessens lever-arm length and fruit loading, while interior laterals develop. But most of the current growth is at the ends, so reduction of each leader must be carefully specified. On the other leaders, reducing lengths from 3 to 9 feet, with cuts, 2 inches or less, seems reasonable. But this lonely leader might need more."

Codit peered upward with his binoculars, leaning left and right. "I see a gap in the crown behind it, which indicates recent downward movement. I also see two routes for two new cables to support this leader without a larger dose of pruning." He pointed to the base of the leader. "Now, what do you make of the green growth in this codominant fork?"

"That's not good," I observed. "Woody plants growing in those cracks indicate composted organic matter and soil where there was once wood. Two additional cables higher up still should mitigate the loss of support in the fork, while conserving enough leaf surface to sustain the leader. But what's composting the organic matter?"

Codit smiled grimly as he scrolled his smartphone's screen. "Get the bird's-eye, or the raccoon's-rear, view, Bossman. I almost stepped in this mess of scat. It seems that mammals are using the fork as a toilet, thereby boosting growth of wood decay fungi. Today a commode, tomorrow a condominium. It's a fiendish plot by those filthy beasts, excreting copious quantities of nitrogen in vulnerable areas to expand their hollow habitat, and rule the tree world!"

I swiped with my thumb and laughed at the sight. "Well, where else do they have to go? We'll specify applying that nitrogenous material at the dripline, to amend the flowerbeds. Soil modification is our fourth mitigation option, after retrenchment pruning, cabling, and IPM at the flare. With potential treatments specified and prioritized, the neighbors should agree that the residual risk would be



The base of the leader has four signs. The smallest sign is the most serious.



Two seams in the fork sport young vegetation, a sign of soil formation.

the neighbors should agree that the residual risk would be low. The assessment, and our assignment, is complete. If a follow-up advanced assessment is needed to satisfy their concerns, each leader could be individually assessed, and deeper soil and root inspection could be done.”

Codit had a satisfied smile as he zipped up his tool bag. “My diagnostic work climb already gave us plenty of info to go with the root conductivity, trunk tomography, resistance drilling, and other tests. There’s a lot you can’t see from the ground. Climbing is such a basic operation. Just setting a ladder at the first forks can reveal new—and disgusting—phenomena. Signs and symptoms say so much! But still, I would not want to work with that scat.”

“Look at it this way, Codit,” I clapped him on the shoulder. “When that job is done, you’ll truly be an arborist who knows his stuff!”

### Additional Reading

- Dunster, J.A., E.T. Smiley, N. Matheny, and S. Lilly. 2013. *Tree Risk Assessment Manual*. International Society of Arboriculture, Champaign, Illinois, U.S. 198 pp.
- Schwarze, F.W.M.R., J. Engels, and C. Mattheck. 2000. *Fungal Strategies of Wood Decay in Trees*. Springer Verlag, Germany. 185 pp.
- Sinclair, W.A., H.H. Lyon, and W.T. Johnson. 2005. *Diseases of Trees and Shrubs (second edition)*. Comstock Publishing Associates, Ithaca, New York, U.S. 680 pp.



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*Photography courtesy of the author.*

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