MYSTIC VALE TREE WALK

MARCH 5 | 12 - 1 | Glover greenhouse

1 – Ferns and burls
2 – Douglas-fir
3 – Ghost maple
4 – Maple cambium again
5 – Western red cedar
6 – *Oemleria cerasiformis*
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10 – Big knees
11 – Why knees?
12 – Pileated woodpecker
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14 – Big alders, arbutus

Mystic Vale Tree Walk – created by Patrick von Aderkas

The stops correspond to the stops on the map. No plant is physically marked with a number. If you are paying close attention, you won't miss any of these. Many are right beside or above the trail.

Stop 1. Sword fern: Found along the west coast from California to Alaska. It has interesting adaptations including the ability to absorb moisture through its leaves, which allows it to live in foggy areas where rain is uncommon, e.g. San Francisco. On Vancouver Island it is the understory fern found in moist forests. It is super easy to grow.

Burls on the surrounding maples are a feature of many maples. They form cylindrical trunks like other trees, but many have irregularities in the growing cells resulting in well-known, predictable oddities in their wood. Birdseye maple patterns, tiger-striping, and burls are all the result of irregularities of the vascular cambium, which is the name for the cylindrical zone of division inside the bark and outside the wood that gives rise to an ever-widening trunk. When thrown on a lathe, burls can make wonderfully interesting bowls.

Stop 2. Douglas-fir. Many get struck down on campus by honey fungus. As these trees are rocked by winter and spring storms, their roots crack. Fungus enters into these cracks and spreads within the tree. You can see many such dead trees on the chip trail in the South Woods. Trees in Mystic Vale are protected from these destructive storms.

Stop 3. Bigleaf maple: When the leaves come out in spring, this one branch of this otherwise normal tree has white leaves. These are a chloroplast chimaera, meaning that they have sectors that lack functioning chloroplasts. Put differently, they have chloroplasts, but they cannot photosynthesize as those chloroplasts lack chlorophyll. It may be due to a mutation in the DNA of the chloroplast, or in the DNA of nucleus of the plant cell in which the chloroplast is found, or both. Sometimes the whole leaf is white, sometimes just a layer within the leaf. When part of a plant shows an obvious difference from the rest of the plant, a difference we can put down to genetics, it's an example of a chimaera. A bud producing such a white set of leaves is an example of somaclonal variation during development. The origin of the branch is from a bud, itself originating as a bump on a growing point of a plant's apical growing point. That growing point is a meristem. A shoot apical meristem is found at the top of a tree, at the tip of every branch. If one branch bud mutates then the mutation is spread throughout the resulting branch. This mutation can't be propagated, because the plant needs to photosynthesize, and these leaves don't photosynthesize. The whole branch parasitizes the rest of the plant. The branch of white leaves is useless, but beautiful.

Stop 4. Maple cambium again. Let's think about how a branch thickens. When you were a child, your fingers were little. They aren't now. How did they grow? The tissues of the digits grew in concert with one another and then stopped. But a branch keeps growing and getting thicker because it has growing zone, a cylindrical growing zone just inside the branch that produces wood (water transport system) to the inside and phloem – a sugar transport system

to the outside. The bark is formed from another cylindrical meristem immediately inside the current bark and outside the phloem. When a branch dies and falls off a maple, the dead wood of the branch rots slowly while the cambia – the cylindrical growing zones – at the base of the branch continue to grow, in this case forming the lip aroumnd the hole. Eventually this becomes the entrance to a hole that will be occupied by squirrels or birds.

Stop 5. Western red cedar does very well in the valley bottoms and ravines of Vancouver Island. That's because there is a lot of water. But western red cedar is in many ways maladapted to those parts of Victoria that are on dry side. This is because western red cedar is an odd tree. When the day is at its hottest, trees like maples and Douglas-fir shut their little breathing pores (stomates) to conserve water. These open again when the heat of the day is past. Western red cedar doesn't shut its little pores and continues to lose water. You can see dead cedar hedges all over Victoria. You can tell who hates their trees and refuses to water them. If you aren't prepared to water your plants in summer, don't buy western red cedar. Just because it's a native species doesn't mean it isn't fussy.

Stop 6. *Oemleria cerasiformis*, Osoberry or Indian plum, is the first native plant to break bud and flower in spring. I used to have a contest with a herpetologist in the department, who insisted that the first sign of spring was the call of the spring peeper, a little frog. On the 31st of January this year, I was on Little Mount Doug. At the base of the hill I saw Indian plum in flower and midway up the hill I heard my first peeper. It was a tie this year.

Stop 7. Huckleberry, Before the second bridge there is a big huckleberry, *Vaccinium parvifolium*. It is a relative of the blueberry. Its sublime little orange fruit is a berry that is delicious in or on a cake.

Stop 8. Restoration. Mystic Vale is the object of many restoration bashes when groups of people come in and pull ivy. The ivy's got to go.

Stop 9. Ivy's deathgrip. This is a rather good example of ivy getting one over on a small tree. You can see where it strangled the young stem of this now dead tree. The ivy was pulled down during restoration work, but the traces of its stem are evident.

Stop 10. Knees. A knee is a trunk that has lost its crown. It is a living stump. Its stem was either snapped off by wind, or broken by big branches that fell on it during a storm. The vascular cambium grows over the top covering the old wood. The trunk itself keeps growing. The stump gets water from its roots, but it also gets water from a neighboring Douglas-fir. This lovely Douglas-fir also supplies it with nutrients, as the knee has no leaves and cannot photosynthesize. How does this work? We think it is like this: during the day water moves up a normal tree that has a crown, from the roots to the needles, where the water evaporates. This is called transpiration and all plants do it. Well, not this living stump. During the day, the water is not moving in the knee. However, at night, when transpiration stops in the normal tree, the root pressure moves the water around the knee. Nutrients are transported by the phloem and we know little about the periodicity of its movements, but obviously the stump is not suffering.

How, then, do these two trees communicate? The answer is that they communicate via their roots have grafted together. Root grafting is common within a species, and even between species. Root grafts in Douglas-fir knees can be with trees as much as 50 feet away.

Stop 11. Knees again. Let's think like scientists. What advantage is there for the tree that is feeding the knee? Is there an evolutionary function, or is it just a neutral phenomenon, meaning there is no advantage to one or the other plant. Or is this parasitism?

If you recall that these trees communicate through their grafted roots, then the living knee is providing a broader root base to the normal tree than it might otherwise have. The broader root base provides greater stability and, because Douglas-fir roots are mycorrhizal, meaning they have a fungal symbiont, the normal tree is profiting from an increased mycorrhizal network. If this is one plant parasitizing another, then which one is being parasitized? Well, that assumes the trees are individuals. Are grafted trees individuals?

What about the wood inside? It's in much better shape than a stump with dead wood that is the same age. Growth is about the same as the normal tree, meaning it expands at about the same rate.

Stop 12. Pileated woodpecker You can see the work of the pileated woodpecker that has gouged out these rectangular holes in its search for bugs. Great Horned Owls can sometimes be heard in Mystic Vale. Barred owls are fairly commonly seen.

Stop 13. Tall trees. The heights of these trees, which are mostly second-growth forest trees, are in the 35-40 m range, i.e. a hundred feet plus in height. The trees are mostly between 100 and 150 years of age. There are a few trees thought to be 350-500 years old. One of them is high up on the opposite bank near the end of the ravine.

Around the corner are patches of skunk cabbage. They have raphide crystals in their leaves that are needles of calcium oxalate. To eat this is to experience a brutally awful pain that lasts for a few days.

Stop 14. Alders & arbutus. This is the end of the tour. You can proceed back to the greenhouse by following the trail upwards past some very nice alder and arbutus trees. On a clear day there is a magnificent view of Mt Baker.

Thank you for coming to Ideafest 2020. There are many other things to see and hear. Most of all thanks for coming on our tree tour.

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