STEAM FYE
Podcast Project
Fall 2022

Dr. Katy Covino
Dr. Erin Rehrig
Librarian Renee Fratantonio

FYE STEAM PODCAST PROJECT At a Glance…

WEEK 10.2 Thursday, November 10th	**LIBRARY SESSION 1 – CLASS MEETS IN LIBRARY**
	
	Agenda
	• Listen to the Podcast "The Secret World of Plants" (9 minutes)
	    ○ Actively listen, paying attention to words and phrases
	    ○ Writing key terms, identifying references to "plant intelligence"
	    ○ Identify potential search terms
	• Find the article by Dr. Beronda Montgomery referenced in the podcast, then download it, print it out, and read it using a "talk to text" strategy
	Microtask
	• Find 3 sources relevant to your group's assigned question
	• Cite sources in APA 7
	
	Bonus 5 minute essay prompt
	Describe the steps you took to find the sources you identified.

WEEK 11.1 Tuesday, November 15th	**LIBRARY SESSION 2 – CLASS MEETS IN LIBRARY**
	
	Agenda
	• Model close reading
	• Demonstrate how to create an annotated bibliography using an article that addresses a question that all groups must incorporate into their Podcasts
	• Describe an annotation for annotated bibliography
	
	Microtask
	• Create an annotated bibliography in APA 7
	• Explain how each source connects to the question your group has been assigned.
	• Your bibliography should include:
	    ○ Full citation: Author. (Date). Title of article: Subtitle of article. *Name of Publication or Journal*, *Vol No.*(Issue No.), pp. #-##. doi link.
	    ○ Summary: What is the source?
	    ○ Analysis: What new information does the source provide?
	    ○ Synthesis: How does the source connect to the other sources you found?

WEEK 11.2 Thursday, November 17th	**LIBRARY SESSION 3 – CLASS MEETS IN LIBRARY** **Agenda** • Incorporating your sources into an audio presentation • Provide copies of the transcript for the "Secret World of Plants" podcast episode • Identify every instance where the podcast host references another source **Microtask** • Produce a script or script outline for your group's podcast. • Identify every instance where you make a statement that is supported by one of your sources. **5 minute essay prompt** Why is it important to back up your statements with evidence?

Each group will create a 5-6 minute podcast that addresses the questions below.

1. **What does it mean to be an intelligent or sentient being?**
2. How do plants "see" light and why is this important?
3. What other senses (smell, taste, hearing) are plants capable of? What functions do these senses serve?
4. What evidence is there that plants can communicate with other plants?
5. What evidence is there that plants can communicate with insects or other animals?
6. How do communication signals above ground (through leaves) vs. below ground (through roots) differ?
7. Can plants feel pain?
8. **Based on the evidence you provide, do you consider earth plants to be intelligent? Why or why not? What about the plants in *Bloom*? Cite or reference the table below in your podcast.**

All groups must address the first and the last question, however, your instructors will also assign one additional question (from 2-7) that your group will research together. In order to successfully complete your podcast, your group will conduct research together using library resources and evidence from ***at least 3 science article digests or abstracts***. One student in the group will serve as the host who facilitates questions, creates a simple script, and summarizes information, while the other two students will serve as science "experts", citing evidence from the group's research.

COMPARISON OF CRYPTOGENIC PLANTS VS. EARTH PLANTS' ABILITIES & CHARACTERISTICS

Page #	**Cryptogenic Plant Characteristics**	**Earth Plants with similar abilities (common names only)**
22, 48, 153	Rapid growth (all three plants)	Bamboo, Phragmites, Mile-a-Minute Vine, Kudzo, Grapevine
40, 115, 120, 241	Strong. Requires chainsaw or knife to cut through (black grass, viney pit plant)	Ash, Hickory, Ironwood Tree (Australia)
47	Produces allomones (pit plants)	Spotted Knapweed, Black Walnut
49	Have dark, almost black color (all three plants)	Black Mondo Grass, Bat Orchid Flower
51, 71	Seeds germinate in water (all three plants)	Tomato, Lettuce
55, 57	Burn like oil & produce thick, irritating smoke (black grass)	Acacia, Eucalyptus
58	Resistant to herbicides (black grass)	Ragwort, Wild radish
68	Produce copious amounts of pollen and has pollen flowers that "pop" (black grass)	Birch, Pine
73	Produce irritating acid or chemical that ***instantly*** burns or blisters flesh (water lily)	Stinging Nettle, Giant Hogweed, Manchineel
103, 105	Produces sweet fruits or nectar and uses bright colors to	Pitcher Plants

	attract animals into a pit (vines of pit plants)	
103, 112, 139, 156	Traps animals in a “sac” and uses digestive acids and corrosive enzymes to consume animal material (pit plants)	Pitcher Plants Venus Fly Traps Sundews
106, 121, 151	Produces a perfume or chemical that is able to induce sleep and/or dilate the pupils	Poppy, Deadly Nightshade, Valerian
127	Plants communicate with each other using volatile chemical signals (black grass & pit plants)	Alder, Lima Bean, Wild Tobacco
139	Vines/plants that are difficult to pull off or grow on top of other plants to choke them out (vines of pit plants)	Virginia Creeper, Ivy, Bittersweet, Kudzu, Strangler Fig
224	Growing in a particular pattern near or away from a stimulus in an “intelligent” manner (vines of pit plants)	Dodder
248	Dispersing seeds from a seed pod violently almost as if “spitting” them out (water lilies)	Touch me not, Squirting Cucumber,
81, 241, 248	Having highly acidic seeds or roots that acidify the water (water lily)	Avocado, corn, rice
259	Produces or “exhales” methane (CH_4) into the atmosphere (water lily)	Rice, marsh plants

References:

1. Appel, H.M., Cocroft, R.B. Plants respond to leaf vibrations caused by insect herbivore chewing. *Oecologia* 175, 1257–1266 (2014). https://doi.org/10.1007/s00442-014-2995-6
2. Schulz, J. (2002). How Plants Fight Dirty. *Nature* (416) 267.
3. Heil, M., (2014) Herbivore-induced plant volatiles: targets, perception and unanswered questions, *New Phytologist* 204 (2) 297-306.

Week 10.2   11/10/22
Activity 1: Assign Partners and Questions

Welcome to class! The first thing we'll do is get you into groups and assign your podcast questions.

Partners Names and Contact Information	Research Questions

Activity 2: Getting Started! "The Secret World of Plants" (9 minutes) Podcast

Sitting with your partners, let's listen to 'The Secret World of Plants' together. As you listen, please take notes below. Specifically, you should be noting and writing down key terms and important ideas related to plant intelligence. We'll use the information you collect to begin to think about search terms.

Key Terms	Ideas about Plant Intelligence

How might the notes you've collected intersect and reflect with your research questions? What might be some good search terms? List three terms in the space below.

Search Term 1	Search Term 2	Search Term 3

Activity 3: Talk-to-Text with work by Dr. Beronda Montgomery

Now, let's review the article written by Dr. Beronda Montgomery (referenced in the podcast). We'll read the first section together - modeling and practicing the 'Talk-to-Text' strategy. Then, you'll work together with your partners to read and annotate the rest of the piece. Please take notes below.

Key Ideas	Possible Search Terms	Questions/Confusions	Links to Podcast Project

Activity 4: Find Three Relevant Sources and Creates APA Reference List

Finally, we'll close class by modeling the process of using the search terms you've generated to find relevant sources. Before you leave for today, please list the three sources below in APA 7 citation format.

Source 1	Source 2	Source 3

Week 11.1 11/15/22
Activity 1: More Practice with Close Reading

We'll start class today by reading through an article that you can all use as one of your sources. As we read, we'll annotate and take notes. More specifically, we'll collect information that we need to incorporate into our annotated bibliography.

First, please list your central questions here.

Question 1	Question 2	Question 3

Now, as we read together, please be listening for information that speaks to/addresses the central questions you're investigating.

Key Ideas - Question 1	Key Ideas - Question 2	Key Ideas - Question 3

Activity 2: Moving into Application - Introducing the Annotated Bibliography

The close reading we've done has shed light on many of your podcast questions. To help keep track of how each source adds to and complicates your growing knowledge, we're going to create an annotated bibliography.

Let's start with the basics. Annotated bibliographies contain some central elements.

- Full citation: Author. (Date). Title of article: Subtitle of article. *Name of Publication or Journal*, *Vol No.*(Issue No.), pp. #-##. doi link.
- Summary: What is the source?
- Analysis: What new information does the source provide?
- Synthesis: How does the source connect to the other sources you found?

Using the space below, please add that information for the source we all read together.

SOURCE 1

Full citation: Author. (Date). Title of article: Subtitle of article. *Name of Publication or Journal*, *Vol No.*(Issue No.), pp. #-##. doi lin	
Summary: What is the source?	
Analysis: What new information does the source provide?	
Synthesis: How does the source connect to the other sources you found?	

Activity 3: Independent Practice - Collaboratively Creating Your OWN Annotated Bibliography
Now, you should be ready to engage in close reading of your other sources. The goal of your reading is to create a complete annotated bibliography in APA 7. Please read through your other sources, and complete your work below.

SOURCE 2

Full citation: Author. (Date). Title of article: Subtitle of article. *Name of Publication or Journal*, *Vol No.*(Issue No.), pp. #-##. doi lin	
Summary: What is the source?	
Analysis: What new information does the source provide?	
Synthesis: How does the source connect to the other sources you found?	

SOURCE 3

Full citation: Author. (Date). Title of article: Subtitle of article. *Name of Publication or Journal*, *Vol No.*(Issue No.), pp. #-##. doi lin	
Summary: What is the source?	
Analysis: What new information does the source provide?	
Synthesis: How does the source connect to the other sources you found?	

Week 11.3 11/17/22
Activity 1: Incorporating Scholarly Information into Podcasts - A Review

Let’s think back to the podcast we heard last week. While it was short, it was jam packed with scholarly information that made the claims more credible.

Together with your partners, please examine the transcript of the podcast. Find at least four instances in which the host alluded to scholarly information. Copy those sections here.

Scholarly citation 1	Scholarly citation 2	Scholarly citation 3	Scholarly citation 4

Activity 2: Incorporating Scholarly Information into Podcasts - Applied Practice

Now, it's your turn. Look back to your annotated bibliography and your collected sources. Work with your partners to create a script for your podcast. Remember, that your podcast MUST 1) address the questions you've been assigned AND 2) cite at least THREE scholarly sources to support your claims.

The steps below may be helpful. If you'd like the full source materials, please click here.

Introduce.
Briefly introduce the source. Identify any important information about the source material, such as the author and/or pertinent background information. Use signal phrases to introduce source material; for example, words like states, suggests, claims, argues, and responds can be used to signal that a quote or paraphrase is being introduced.

Use and Cite.
Now that the information has been set up properly with a brief introduction, it is time to actually use the source material.

Analyze.
Merely utilizing the source material does not mean the work is finished. The most important step is the last: analyzing. Every time source material is used, it must be analyzed. Listeners need to clearly understand why the source was chosen. How is the information relevant to the topic? How does the material support the main idea?

As you draft your script, you may want to start with an outline.

Introduction
Introduce yourselves, the class, and the central questions you've explored

Question 1
Address/explain the question.
Share your response.
Include outside information, citation, analysis and synthesis.

Question 2
Address/explain the question.
Share your response.
Include outside information, citation, analysis and synthesis.

Question 3
Address/explain the question.
Share your response.
Include outside information, citation, analysis and synthesis.

Conclusion

Transcript for "The Secret World of Plants Podcast"

Hi I'm Wendy Zukerman and you're listening to Science Vs from Gimlet. Today we've got a mini episode for ya - where we are digging up the dirt on plants.

dudududu

Recently we had a chat with Professor Beronda Montgomery, she studies plants at Michigan State University[1] and she told us these wild stories about how weird… and clever plants can be...and we needed to tell you all about it. *dudududu*

Beronda is a massive nerd - when she was little she did this experiment into how well **different types of paper can burn.**

BM: (Laughs) So I was very much into science and when I was little and when I was 6, I talked my nine year old sister into being my research assistant. And I had gathered all these different papers, toilet paper, writing paper, construction paper, and I wanted to set them on fire all at the same time to see which one burned most quickly.. And my sister was supposed to be the lookout and it got a little bit out of hand. She quit her job and ran away and it was problematic. So that was one of my first science experiments.

WZ: (Gasps)(Laughs)

WZ: Wait wait wait, now I want to know, so was it the toilet paper that burned the fastest?

BM: (Laughs) It was that one. And that's also the one that fell off of the table and started to cause problems. But, you know, I had a hypothesis that I was right. It just didn't quite work out like I intended. (laughs). At this point in her life… Beronda was not that excited about plants… I mean… unless she was setting them on fire.

BM: Well because if you look at them, they just kind of look like they're sitting there and if you're not paying close attention to them, a new leaf might come out. But it's not as you know, it's not like watching puppies run around or all of those exciting physical motions that we see with animals. So they in a lot of ways just look like they're sitting there not doing anything too exciting. But once she went off to college…that's where her love of plants really took root. She learned that plants aren't just sitting in the dirt … popping out leaves and flowers, looking pretty for us. They have a whole bunch of tricks up their leaves… to help them stay alive.

BM The ways in which they thrive and defend themselves, was just really fascinating to me
So when danger strikes ... plants don't have weapons, like guns and they can't run away… but instead they have other ways of protecting themselves…with **CHEMICALS**[2][3][4]**…** Like studies have found that if a bug - like a VERY hungry caterpillar - starts munching on, say, a tomato plant ...

BM: They produce chemicals that are the kind of anti-digestion chemicals[5][6] that inhibit the caterpillar's ability to digest the food[7] so they can make something that makes the caterpillar sick.

WZ: Oh, wow. They slowly kind of poison the caterpillar. To save themselves.[8][9]

BM: Yes, yes, yeah.
So sometimes they'll straight up pump out nasty chemicals to mess with the bug's insides.. but sometimes... plants go even more hardcore. Bringing a bigger and brawnier insect for help.

Yeah… Beronda told us that some plants use chemicals to attract predators that will then eat the bug that's attacking them …[10][11][12] Imagine an aphid chewing on a leaf… nom nom nom… the plant springs into action … popping these chemicals into the air…

BM: And so it says what you like to eat is here and available and then they attract a wasp that uses that little bug as food… and so then that plant is then protected[13][14]

WZ: (Gasp) Wow

BM: It's really cool, I told you plants are super cool - hehhehe. I told you! Much cooler than anything we just say please leave me alone.

WZ: (Laughs)
And what's really special about this chemical warfare going on -- is that plants aren't just using it to defend themselves -- they can use their powers to warn other plants, friends - if you will -- of what's going on. So, when under attack, some plants can send out these chemical messages that get picked up by their leafy neighbors..

BM: And so one one plant will say that I've been damaged. You should be aware that there are herbivores in the environment. So put your defenses up[15][16]
For example, studies in corn have looked at this ... scientists will mimic an attack[17] … and watch as the corn pumps out these so-called warning chemicals into the air… and soon after, neighbouring plants… despite not being under attack in that moment -- they pick up on those chemical signals - and see them as kind of a call to arms…and get ready to fight, too.
Pretty a-MAIZE-ing, right??[18][19][20][21]
Beronda says that some scientists are starting to think about all these chemicals flying about… as a kind of language…

WZ: Can plants talk?

BM: So I think plants can talk. Plants definitely have a language. Many of us have this kind of innate response to think of things through our understanding of our presence in the world... And so we think about talking as words, we think about hearing as detecting the words, And so often we're looking at other organisms through the lens of our understanding of our place in the world. And we wouldn't have imagined that language could be a chemical when we use vowels and nouns and words.

WZ: It's really special, because when you see a plant just sitting there loafing about...you don't think they're chatting

BM: Exactly, yes, exactly. Very much so.
And Beronda says that even though plants don't speak our language... we are connected to them. I mean in these obvious ways -- like we eat them - and plants make oxygen that we need to breathe[22]. But in less obvious ways too… which Beronda started thinking about on this recent trip she made to South Carolina. Beronda was visiting a cotton plantation.[23] It had been one of the South's largest plantations - enslaved people had been forced to work there for generations.[24] And Beronda went because her sister and son wanted to go.

BM: I had no interest. I'm not going to even lie, I just, I wasn't drawn to it. But this is what they wanted to do. So I went and that day it was about to rain. And I actually was like, OK, well, if it rains, we won't have to stay long.

But her attitude changed when she saw this beautiful oak tree. It was a massive tree with heaps of green moss hanging down from its billowing branches.[25]

BM: Our tour guide explained that it was 600 years old.[26] And it occurred to me that the tree was there the entire time, that these enslaved people who could have been related to us were there.

And for Beronda - looking up at this Oak - she started thinking about… the relationship between the people who might have been her ancestors -- and this tree.[27]… And that's because when we breathe out carbon dioxide it can get captured in these little openings in a tree's leaves[28][29]...

BM: And knowing that carbon dioxide becomes a part of the plants that take it up, it occurred to me that the breath of these people was a part of the tree… And so really there's a direct connection with the carbon dioxide we breathe[30] being put into the wood of a tree.[31][32][33] And so at some level in that tree was the captured carbon dioxide of my enslaved ancestors. And so I really felt a deep physical connection with that particular tree. But it also got me to thinking about how daily as we're going through our lives we're really putting our carbon dioxide into the physical nature of plants around us

WZ: You wrote in an article about this that trees quote carry the very essence of humans, both past and present in their bodies

BM: Absolutely. Absolutely ...

WZ: Did you just stand under the tree?

BM: Yeah my son and my sister had gone off and I literally was there looking at the tree, thinking about it. And it's really quite a joke, because when this article did come out in American Scientist,[34] my son said, I can't believe — you didn't even want to go. And you wrote a whole paper about it. (Laughs)

That was Professor Beronda Montgomery, a plant scientist at Michigan State. She has a new book out right now called Lessons from Plants[35] where she talks more about all the cool things we can learn from our leafy friends. It's great - you should check it out. Lessons from Plants.

That's Science Vs.

This episode was produced by Taylor White with help from me, Wendy Zukerman, Nick DelRose and the Science Vs team. Mix and Sound Design by Catherine Anderson. For full credits, check out our show notes.

References used in this Podcast:

---

[1] Beronda Montgomery, Prof of Biochemistry & Molecular Biology and Microbiology & Molecular Genetics in the Department of Energy (DOE) Plant Research Laboratory at Michigan State University (MSU).

[2]2021: Plants make a variety of molecules that serve to protect them against hungry insects. Li et al. analyzed the balance between plants defending themselves and plants poisoning themselves. In wild

tobacco (Nicotiana attenuata), two cytochrome P450 enzymes work within the biosynthetic pathway of 17-hydroxygeranyllinalool diterpene glycosides to help prevent the accumulation of toxic diterpene derivatives. Those same diterpene derivatives are formed in an insect herbivore after ingestion and cause toxicity by inhibiting sphingolipid biosynthesis in both plant and insect.
[3]2014: A. thaliana produces three major classes of chemical defenses in greater amounts following insect damage: glucosinolates (GSs: Mewis et al. 2005), the polyphenol anthocyanins (ACs: Ferrieri et al. 2013), and a suite of volatile compounds (Snoeren et al. 2010).
[4]Rather than acting as passive victims in these interactions, plants respond to herbivory with the production of toxins and defensive proteins that target physiological processes in the insect.
[5]In 1972 when Green and Ryan reported that wounding by Colorado potato beetles causes the rapid accumulation of proteinase inhibitors in potato and tomato leaves. As inducible resistance factors which interfere with the digestive system of leaf-consuming insects, the proteinase inhibitors were suggested to defend the plants against herbivores...proteinase inhibitors can be induced by damage (Bergey et al.1996; Koiwa et al.1997; Ryan 2000; Tamayo et al. 2000), lowering the digestibility of the plant material for herbivores and thereby increasing plant resistance. Scihub
[6] Protease inhibitors are an important element of the plant defense response to insect predation...Production of these inhibitors is highly regulated by a signal transduction pathway that is initiated by predation and transduced as a wound response.
[7]When larvae of the lepidopteran insect Spodoptera littoralis were fed on maize leaves, MPI accumulated in tissues adjacent to the wound site. The level of inhibitor accumulation was higher in leaves chewed by larvae than in leaves that had been damaged mechanically. ...both elastase and chymotrypsin-like activities from the larval midgut of S. littoralis were effectively inhibited by MPI.
[8]Insects mainly use one or a combination of serine, cysteine and aspartic proteases as major digestive proteolytic enzymes 4. Inhibitors of these enzymes are produced by plants, and presumably modulate the growth and development of pests by attenuating protein degradation.
[9] Generally, PIs can inhibit the protein digestive enzymes in the gut of insects, resulting in amino acid deficiency and subsequent delayed development, death, and/or reduced fecundity [26].
[10]These gaseous signals are often released from damaged plant tissues, advertising the presence of potential prey. VOCs can vary with time of attack (e.g., night vs. day) or herbivore identity to attract predators best adapted for a particular herbivore. For example, broad bean plants (*Vicia faba*) attacked by different species of aphid (*Acyrthosiphon pisum* and *A. fabae*) release different VOCs that attract different predators
[11] Herbivore-challenged plants also emit volatiles that attract insect predators and bolster resistance to future threats. This highly dynamic form of immunity is initiated by the recognition of insect oral secretions and signals from injured plant cells.
[12] These compounds can attract both herbivorous and carnivorous arthropods on the one hand (Whitman and Eller 1990; Shiojiri et al. 2006), and prime neighboring plants for the induction of defenses on the other (Engelberth et al. 2004; Ruther and Fürstenau 2005).
[13] Herbivore induced release of plant volatiles mediating the foraging behavior of the aphid parasitoid Aphidius ervi was investigated using the pea aphid, Acyrthosiphon pisum, feeding on broad bean, Vicia faba. ...Volatiles obtained by air entrainment of aphid infested plants were more attractive to A. ervi than those from uninfested plants, in both behavioral bioassays.
[14] Attraction by volatiles from host-infested plants and by EFN was shown for egg as well as larval parasitoids and predators ...Induced levels of EFN also increase the abundance of ants, wasps and flies (Kost and Heil 2005), and reduce the amount of leaf damage (Heil 2004). (Also, See Table 2.2)
[15]2019: VOCs can also affect neighboring plants, resulting in increased resistance in these plants [7, 8]...They also emit volatile organic compounds (VOCs), e.g. when exposed to drought or herbivores
[16] Herbivore-induced plant signals can be exploited by neighboring plants of the same and of different species alike (Engelberth et al. 2004; Baldwin et al. 2006). Strong signals may immediately activate plant defenses, while lower (more common in nature) concentrations of signaling molecules can prime the plant for attack (Turlings and Ton 2006). This was nicely shown in a field study by Kessler et al. (2006) reporting that plant volatiles from damaged sagebrush plants can prime the induction of proteinase inhibitors in nearby tobacco plants. The primed tobacco plants received less damage from subsequent herbivore attack as compared to non-exposed control plants.

[17] Two-week-old maize plants (var. Delprim) were induced by scratching the leaf surface and applying 10 µl of Spodotera littoralis regurgitant.
[18]we show that herbivore-induced indole enhances the induction of defensive volatiles in neighbouring maize plants in a species-specific manner….Indole exposure itself did not induce the release of volatiles. However, upon elicitation treatment, the release of GLVs, including (Z)-3-hexenal, (Z)-3-hexen-1-ol and (Z)-3-hexenyl acetate from fresh wounds was significantly enhanced in indole-exposed plants
[19] we show that herbivore-induced indole enhances the induction of defensive volatiles in neighbouring maize plants in a species-specific manner
[20]Herbivore-induced plant volatiles (HIPVs) provide direct benefits to plants as antimicrobials and herbivore repellents, but their potential as direct toxins to herbivores is unclear...These results support a key ecological precept of a trade-off between host specialization and chemical detoxification and also indicate that indole in particular is directly toxic to herbivores and therefore potentially useful in integrated pest management strategies.
[21]DIVs [Damage-Induced Volatile compounds] are (i) specifically synthesized and emitted upon tissue disruption and (ii) can serve as intra- and interplant signals initiating immune responses as well. Due to their generation upon injuries or damage, these compounds can also be classified as DAMPs. Mainly GLVs but also DMNT and indole fulfill the criteria to be classified as volatile DAMPs in *stricto sensu*.
[22] Through a process called photosynthesis, leaves pull in carbon dioxide and water and use the energy of the sun to convert this into chemical compounds such as sugars that feed the tree. But as a by-product of that chemical reaction oxygen is produced and released by the tree. It is proposed that one large tree can provide a day's supply of oxygen for up to four people.
[23] https://www.ccprc.com/1447/McLeod-Plantation-Historic-Site
[24]McLeod later became one of the South's largest Sea Island cotton plantations, encompassing 900 acres at its heyday, and producing a large crop of Sea Island cotton with a labor force of 70 enslaved Africans.
[25]Photo of the tree
[26]The grounds include a riverside outdoor pavilion, a sweeping oak allée, and the McLeod Oak, which is thought to be more than 600 years old.
[27] This awareness weighed heavily in my thoughts and led me to question what this oak's life had been like, and what it had witnessed of the lives of the people living together with it on the McLeod land.
[28]Stomata are cell structures in the epidermis of tree leaves and needles that are involved in the exchange of carbon dioxide and water between plants and the atmosphere.
[29]Stomata and mesophyll play vital roles in CO2 diffusion pathway in leaves. In general, atmospheric CO2 (Ca) diffuses through stomata to the intercellular space and then across mesophyll to the carboxylation site in the chloroplast.
[30]This study constructed a vertical garden in an indoor environment to absorb the Carbon dioxide (CO2) exhaled from human breathing, in order to improve the indoor air quality through plant photosynthesis….The experimental results showed that, after 150 minutes, 13% of CO2 generating from the human breathing can be absorbed by the 240 plants
[31] rising atmospheric CO2 may directly influence net photosynthesis, plant growth, and productivity (5). Termed the fertilization effect, enhanced growth in response to artificially elevated CO2 has been observed in greenhouses and in limited field experiments (6).
[32]The harvested light energy, together with the uptake of animal- and human- exhaled carbon dioxide (CO_2), drives the production of sugars through photosynthesis, and the subsequent release of the byproduct, oxygen. This byproduct is essential for the animals and humans sharing the habitat with plants and, indeed, forms a return gift in a process of reciprocity for the CO_2 that plants receive.
[33]That very same tree took that expelled air, breathed from the lungs of all those students and now rich in carbon dioxide, and drew it back into itself to grow. Think of that. All those students who passed that tree over the past half-century have given a part of themselves to help form the wood at the heart of that tree. The tree is recording a history of us. In this way, the tree is us.
[34] Beronda's article
[35] Beronda Montgomery's book, Lessons from Plants

Notes/Transcript Draft

Notes/Transcript Draft

Notes/Transcript Draft