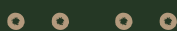


MY PHILODENDRON'S FAVORITE MUSIC IS BEETHOVEN: CONSIDERATIONS OF PLANT SENTIENCE

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It is necessary to look at how things we may consider ‘below us’ have sentience, and in turn a developed consciousness, on their own in order to take away the notion that one species is above the other; each one shares the world and influences the development of the other. Through plants, we can further understand our minds and how the environment around us fosters sentience. In this essay I argue that plant life, specifically through examining mushroom forests and extreme reactions from other plant types, contains a level of sentience, consciousness, and intelligence previously ignored. “Arts of Inclusion, or How to Love a Mushroom” written by Anna Tsing develops the basic information about the lives of mushrooms and their interactions with

habitats within the essay, while “Multispecies Studies: Cultivating Arts of Attentiveness” informs the argument of sentience within beings other than humans. Through looking at studies of plant interactions with each other, their environment, and humans in *The Island of Missing Trees*’s chapters “Roots,” “Trunk,” and “Ecosystem” in addition to scientific research about the subject, I argue that different species of plants are sentient beings and deserve the same respective level of attentiveness. This attentiveness can change how plants are seen and characterized in the everyday, academia, and media.

There have been many experiments done to determine if plants are sentient, conscious, both, or neither through the years. In the media, this idea has been explored in various genres, ranging from science fiction to dystopian to the supernatural. Although further scientific research into this field is important for understanding human consciousness and other notions, this essay aims to examine and add to the social considerations of this question. The purpose is to bring social awareness to the experiences of plants and mushrooms in order to facilitate better reciprocal relationships between humans and other species. In this essay, I argue that plant life, specifically through examining mushroom forests and extreme reactions performed by other plant types, contains a level of sentience, consciousness, and intelligence previously ignored by the general public. Through looking at studies of plant interactions with each other, their environment, and humans in Elif Shafak's *The Island of Missing Trees*'s parts "Roots," "Trunk," and "Ecosystem," in addition to scientific research about the subject, I argue that plants and mushrooms are sentient beings and deserve a respective level of attentiveness. This attentiveness can change how plants are seen and characterized in the everyday, academia, and media. Once they are understood as active participants in society, people might take more care and responsibility when interacting with plant life. This can help resolve some environmental issues if not all.

The Science

There is a lot of vocabulary that goes into this topic that I will define here. Firstly, *consciousness* can be defined as feelings plus an awareness of events that includes awareness of internal states or "recurrent and self-sustaining activity of certain biological structures, based on the temporal synchronization of functional networks" (Nani 66). *Sentience* is better defined as "the presence of some subjective phenomenal experience, be it of the external world or of oneself" (Segundo-Ortin 1) or "feedback processes directed to maintain the integrity of the organism" (Nani 69). Part of the criteria for both classifications is *behaving*, which can be defined as

“any measurable response of an organism” from *The Penguin Dictionary of Psychology*. In order to say that something is behaving, a difference between cognition and adaptation must be established; the response must be unable to be explained away by adaptation. Though they initially may seem the same, consciousness and sentience operate at diverse levels that need to be considered when asking if a thing can be classified as either. Another criterion that comes up is intelligence, which is defined as “the ability to learn or understand or to deal with new or trying situations also: the ability to apply knowledge to manipulate one’s environment or to think abstractly as measured by objective criteria” by the *Merriam-Webster Dictionary*.

The line between consciousness and sentience is very blurry. For some individuals, there is no line. The defining features of each term are fairly subjective despite the definitions given earlier, as they are still constructs that humans do not fully understand yet. In order for plants to have a sense of awareness as we understand it, there needs to be an exchange of information between their internal and external environments: a process of collecting information from external stimuli, processing it, and using it in ways that are not simply *reacting* to things. There have been numerous experiments done (by both those who agree with plant sentience and those who do not) that have studied the sunflower, the Cornish mallow, the thale cress, the common purslane, and the *Boquila trifoliolata*—to name a few—to discern plants’ levels of cognitive response, showing that they are able to adapt to and predict their environment beyond a simple mechanical response to stimuli (Nani 62). Similar to animals, plants use electrical signals such as action potentials and ion movements throughout localized areas and the entirety of their bodies, have specialized fibers that function similarly to animal muscles, and not only contain chemicals such as GABA, serotonin, dopamine, melatonin, and glutamate—some of which are considered key parts of animal nervous systems—but use them in similar or the same way that animal bodies do. One of these, GABA, is “an amino acid that decreases the receptivity of neurone membranes

to being excited by electrical signals,” which plays a key role in how the brain functions. Receptors for this acid have been found in plants, showing that it operates as a signaling molecule within them, as it does for animals (Calvo 99). Though plants do not have a nervous system like humans or animals do, they have complex vascular systems interlinked by numerous, irregular cross-links of tissue where their electrical firing events occur. A. Nani in “Sentience With or Without Consciousness” uses this information to conclude that “plants are therefore equipped with a complex communication system, which can convey information inside the plant, by means of electrical and chemical signaling, as well as within and between species” (65). Communication occurs mainly through the roots, which make up over half of the organism and collect the necessary information about the living and non-living environment around the plant. A root system will form relationships with the other plants around it, including fungal threads. In a mutually beneficial relationship, fungi possess the “chemical tools to harvest from the soil precious resources such as phosphorus and nitrogen” (Calvo 39) that plants cannot secure themselves, while plants “have the alchemical ability to create sugars from sunlight through photosynthesis, to which they allow the fungi to access” in return (39). A big name in the world of plant science, Suzanne Simard, was the one to discover how this furthered tree agency. Simard’s research details what has been called the “wood-wide web” through which the forest regenerates itself, where older Mother trees sustain saplings through a network of roots and fungi (O’Neill 12). Reviewing her work, Simard comments that trees “perceive, relate, and communicate; they exercise various behaviours. They cooperate, make decisions, learn, and remember—qualities we normally ascribe to sentience, wisdom, intelligence. By knowing how trees, animals, and even fungi...have this agency, we can acknowledge that they deserve as much regard as we accord ourselves (qtd. in O’Neill 13). “Arts of Inclusion, or, How to Love a Mushroom” by Anna Tsing goes into detail about how exactly this “wood-wide web” works:

Fungi make those webs as they interact with the roots of trees, form-

ing joint structures of fungus and root called ‘mycorrhiza.’ Mycorrhizal webs connect not just root and fungus, but, by way of fungal filaments, tree and tree... There are many ways to eat here and to share food. There is recognizable hunting in the city: for example, some fungi lasso little soil worms called nematodes for dinner. But this is just the crudest way to attune one’s digestion. Mycorrhizal fungi siphon energy-giving sugars from trees for their use. Some of those sugars are re-distributed through the fungal network from tree to tree. Others support dependent plants, such as mushroom-loving ‘mycophiles’ that tap the network to send out pale or colourful stems of flowers (e.g., Indian pipes, coral-root orchids). Meanwhile, like an inside-out stomach, fungi secrete enzymes into the soil around them, digesting organic material and even rocks, and absorbing nutrients released in the process. These nutrients are also available then for the trees and other plants, which use them to produce more sugar for themselves—and the network. In this process, too, there is a whole lot of smelling going on...(Tsing 1-2)

A. Nani in “Sentience With or Without Consciousness” goes further to include that “communication can also involve insects, some of which are attracted or repelled by certain substances produced by plants” (65). Plant communication is very complex, something not fully understood yet. It is not far-fetched to say that it is underpinned by cognitive processes that lend themselves to plant sentience.

Lastly, how does this tie into multispecies studies? The term *multispecies studies* is explained in the article “Multispecies Studies: Cultivating Arts of Attentiveness” as,

Unsettling given notions of species, it explores a broad terrain of possible modes of classifying, categorizing, and paying attention to the diverse ways of life that constitute worlds. From detailed attention to particular entities, a multiplicity of possible connections and understanding opens up: species are always multiple, multiplying their forms and associations. It is this coming together of questions of

kinds and their multiplicities that characterizes multispecies studies. (van Dooren et al. 1)

In line with this definition, the question of plant sentience usurps accepted ideas around plants, explores new modes of classifying and categorizing plants—which leads to new categorization of other species as well—and attends to the diverse ways in which different plants operate in reality and within media. The relatively new field of plant neurobiology conducts research into plant signaling and behavior, looking for similarities between animal neurobiology and plants, specifically “it seeks to ascertain whether in plants there are chemical substances with functions analogous to neurotransmitters, so that they may mediate adaptive responses in short or long periods of time” (qtd. in Nani, 61-62). Sometimes unknowingly and sometimes intentionally, books, television, movies, and other media draw references from questions that this subfield of plant biology seeks to address. There are many factors that build up the argument for plant consciousness that media also uses to portray plants and (or) mushrooms in several interesting ways. Miguel Segundo-Ortin lists the most widely cited empirical evidence of plant consciousness as plants’ communication, kin recognition, decision-making, anticipatory behavior, learning and memory, foraging and competition, risk sensitivity, mimicry, numerosity, and swarm intelligence (3-8). In characterizing plants and mushrooms, media may give them these qualities, heighten these qualities, or use these qualities as a starting point to fully personify plant and mushroom life. This evidence is reached through several disciplines, such as molecular biology, electrophysiology, biochemistry, evolutionary and developmental psychology, and plant ecology, which media may also pull from in world-building (Segundo-Ortin 9).

The Considerations in Media

Elif Shafak’s *The Island of Missing Trees* follows the intricate lives of Kostas, Defne, and their daughter Ada, examining the consequences of civil war in their home country of Cyprus while Ada and Kostas are also

dealing with the death of Defne after the family immigrated to London. Intertwined with their story is the life of a fig tree, *ficus carica*, that watched the love between Kostas and Defne bloom, the devastation of civil war on Cyprus, and then the relationship between Ada and Kostas change after Defne's death. Shafak takes plant sentience to its furthest consideration of a separate arboreal experience of the world when writing the fig tree as a narrator within the novel. She does this through the rhetorical device of anthropomorphism, which is "an interpretation of what is not human or personal in terms of human or personal characteristics" according to the *Merriam-Webster Dictionary*. The fig tree is not only allowed subject status in the story; it also has its own voice, knowledge, and experience of the world around it that is deliberately shared with the audience. It is imperative that we receive this point of view. Much of the history of Cyprus, the ecosystems of Cyprus (and Britain), and the history of families are revealed through the fig tree's voice. If not for the tree's witty phrases, wonderful prose, and philosophical wonderings about humanity in relation to plants, parts of the history of Cyprus and the people there would have been lost in the story. The fig tree stands as a major witness, a "more-than-human medium" (O'Neill 3) able to share an arboreal point of view that "enacts an intraspecies communion with nature" that is shared with the audience (3).

The novel does this by amplifying the characteristics of communication, kin recognition, learning, memory, risk sensitivity, and swarm intelligence seen in plants, constantly playing with the restrictions and possibilities of human knowledge about trees. True to the part of the tree it is named after, the "Roots" section of the novel goes into detail on the communication aspect of the fig tree within the novel. It touches on other qualities, like kin recognition and of course, memory, to inform the conversation centered around communication. At this time in the novel, the fig tree is buried underground to ensure it survives the winter. For this reason, its exchanges with various beings through its roots are central since it cannot "see" anything going on above ground. Shafak uses this as a moment

to give the audience insight into the underground workings of the “wood-wide web” that informs the tree while it is buried, showing her knowledge of phytology, and legitimizing her use of the tree as a narrator. The tree gives background into how plants interact and work with the environment intertwined with its own personal feelings on the matter:

Under and above the ground, we trees communicate all the time. We share not only water and nutrients, but also essential information. Although we have to compete for resources sometimes, we are good at protecting and supporting each other. The life of a tree, no matter how peaceful it may seem on the outside, is full of danger...we have to work together. Even when we might seem stand-offish, growing away from others or at the edge of forests, we still remain connected across entire swathes of land, sending chemical signals through the air and across our shared mycorrhizal networks. Humans and animals can wander around for miles on end in search of food or shelter or a mate, adapting to environmental changes, but we have to do all that and more while rooted to the spot. (Shafak)

Even though the author personifies the tree in the novel, there are still elements to its characterization that remain distinctly plant-like; it is not telling a human’s story through a tree, it is telling a tree’s story in a way humans can comprehend it. The tree has its own emotions and opinions about humanity, war, plants, and animals that the audience becomes privy to as it recalls its life through the years, uncovering the silent world of arborealities in an attempt to make them more accessible. Through this, the novel is able to discuss the traumatizing nature of war and suffering not being unique to humans. Clearly, the devastation wrought by war affects plants and animals as well. The tree’s identity as a witness to this history of civil war in Cyprus legitimizes its presence as the subject and narrator of the novel. The tree’s *sentience*, “the presence of some subjective phenomenal experience, be it of the external world or of oneself,” (Segundo-Ortin, 1) is the foundation of its ability to bear witness. It is feeling and behaving in accordance with its reactions to the devastation of war

wrought on its tree kin and its family in Kostas, Ada, Delfine, Yiorgos, and Yusuf. In order to say that something is behaving, a difference between cognition and adaptation must be established. The response must be unable to be explained away by adaptation. Like in humans, emotions and emotional reactions to terrible situations are much more than an adaptive advantage; one might say that in certain situations they are even detrimental to survival. Another criterion that comes up is intelligence, which is defined as “the ability to learn or understand or to deal with new or trying situations” by the *Merriam-Webster Dictionary*. Following this definition, the generational trauma that afflicts the fig tree is a sign of its intelligence; the effort it puts into trying to relay this traumatic feeling fits the second half of the definition, “the ability to apply knowledge to manipulate one’s environment or to think abstractly as measured by objective criteria,” by showing the tree applying its knowledge of humans and war to understand Ada, as well as persuade the audience into respecting its authority. With the tree’s philosophical commentary, it shows a deeper self-awareness and awareness of societal issues present in its environment. Scientifically, it demonstrates an exchange of information between its internal and external environments.

Similar to its identity as a witness, the fig tree’s importance in the narrative is determined by the tree’s risk sensitivity in a philosophical manner, as it questions its safety, the safety of Kostas and Ada, and the consequences of war. Moreover, the narrative power of the tree is cultivated primarily from its ability to learn and contain memories. It is the one that recounts imperative moments for the audience, giving necessary context for the actions of Kostas, Ada, and Aunt Meryem in London. Throughout the section “Trunk,” the tree talks about the devastation and consequences of the war on itself and those it held dear. These chapters bring the living quality of the tree to the front of the audience’s mind in a different way than previous chapters. They rely on emotional connections and reactions to the tree consoling itself, expressing sadness for the people close to it, and recounting the travesty of war. The way the fig tree

discusses this past connects to something it says earlier in the novel, explaining that “the dilemma between optimism and pessimism is more than a theoretical debate for us [trees]. It is integral to our evolution” (Shafak). Although it is narrating a terrible time, the fig tree also deliberately describes the positive times that were created to combat the fear of the unrest in Cyprus afterward, comparing human resiliency to strengths it finds in nature through a hopeful tone. It can be seen through this that the fig tree chooses optimism and solidifies a literary evolution of creative narratives from plant life. In “Ecosystem,” *The Island of Missing Trees* directs the characteristic of memory towards developing the fig tree’s relationships through time. The third person narrator writes:

Arboreal-time is cyclical, recurrent, perennial; the past and the future breathe within this moment, and the present does not necessarily flow in one direction; instead it draws circles within circles, like the rings you find when you cut us down. Arboreal-time is equivalent to story-time – and, like a story, a tree does not grow in perfectly straight lines, flawless curves or exact right angles, but bends and twists and bifurcates into fantastical shapes... They are incompatible, human-time and tree-time. (*The Island of Missing Trees*)

Through the discordance of human and arboreal understandings of time, the fig tree is important not because of its relevance to humans, but because it is a vibrantly alive organism that operates beyond human comprehension (O’Neill 16). Perceiving trees as subjects, as vibrantly active, starts to remove the barrier between them and humans and opens the space for further talk about their consciousness and reciprocal relationships with them. In multiple passages in “Roots” and “Trunk,” the fig tree shows recognition of kin in retelling its “family” history (including Kostas and Ada amongst its family); it also recognizes other species of trees as kin, despite negative opinions about them, for the fact that they are all trees. In “Branches,” the fig tree explains that “[f]igs are sensual, soft, mysterious, emotional, lyrical, spiritual, self-contained and introverted,” alluding to a kept knowledge of “family” history coupled with showing a recognition of

other tree species and alluding to a collective intelligence as it continues to say, “Carobs like things to be unsentimental, material, practical, measurable. Ask them about matters of the heart and you will get no response... If a carob tree were to tell this story, I can assure you it would have been very different to mine” in such a manner-of-fact way (Shafak). The fig tree’s knowledge of other species and the consequences of war throughout the novel operates off of the swarm intelligence of surrounding plants and its relation to Kostas in addition to the animals that it comes in contact with. O’Neill explains it as the novel disrupting “the silent logos of plant life to express a rich arboreal knowledgebase that extends to the fig tree a quality associated with the human, disrupting traditional hierarchies of human/vegetal being in favor of a relationality. Shafak’s novel branches outward to ask that we not only know trees better but learn from them” (O’Neill 14). *The Island of Missing Trees* is an important addition to academia for its work of understanding nature through its inclusion of biology and philosophical propositions, additionally doing so in a way that creates a new standard for respecting the agency of plant life in creative works.

The Implications

When thinking of animal intelligence, it is often attributed to the movement that animal bodies require and minds facilitate, but this excludes animals that do not move, such as coral, sponges, and sea anemones. Are these not animals? If they are indeed animals, then do they not also have a level of intelligence? This inconsistent cataloging of beings causes issues in research and academia as humans are predisposed to be more interested in something they can relate to or know can affect them immediately. There is an underlying bias that for something to be important (and for this topic, conscious) it must be “like” the individuals studying it. This “likeness” does not have to be large; it can be as simple as the ability to move. A. Nani notes in “Sentience With or Without Consciousness” that:

Researchers in the scientific field of consciousness studies still dis-

agree as to what the real nature of consciousness is and as to which living organisms are to be considered conscious. Most research between species is comparative: investigators search similarities of structures and functions. (65)

Consequently, when choosing a being to research—or at the very least pay attention to—plant life has gotten the short end of the stick. To change the opinions and practices surrounding plants and mushrooms, there needs to be “passionate immersion in the lives of the nonhumans being studied” (Tsing 17). This reflects the true nature of the natural world, as “human existence, though no doubt precious beyond words, had no special priority in the ecological chain” (Shafak). This is mirrored in creative works; exploration of environmentalism, animal intelligence, artificial intelligence, and futurism are seen in different genres, but considering plants and mushrooms as their own active, willing, and conscious participants is seen less, even within themes of environmentalism. As seen with popular media such as HBO’s *The Last of Us* and *Scavengers Reign*, the inclusion of plant life as an active character to build a wildly different point of view can make media more believable and entertaining. There is much speculation in and about the field of plant neurobiology still, questions and considerations that will not have answers until well into the future. However, that does not mean that reactions to these questions should not be thought of or acted out before then. Zoocentric thinking, giving animals preference above other considerations (largely how Western society thinks), is the antithesis to considering plant sentience and is harmful for many reasons in the long run. As Tsing said, “No one stops to ask, ‘Wellbeing for whom?’ ...experts and objects are separated by the will to power; love does not flow between expert and object” (17). Considering plant consciousness, sentience, cognition, or any other form of understanding is a step towards thinking of plants as active participants in the environment as well as history. Once that is recognized, then further solutions for social issues can be reached. Exploring this argument creatively through novels, television, and other forms of media investigates different reactions to plants, moreover, futures

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where certain responses foster a better—or worse—environment and better understanding of humanity’s place in the environment. This interspecies understanding is central to multispecies studies.

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