Hobbes is a Fungi: Civil Society Rooted in Nature

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ABSTRACT

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Hobbes is a Fungi: Civil Society Rooted in Nature

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Thomas Hobbes uses a metaphor about mushrooms to define humans in the state of nature. In light of recent research regarding mycorrhizal fungi, this thesis examines the descriptive and prescriptive implications of a civil society structured as though people were truly like mushrooms. By drawing upon the intersection between political theory and ecology, this thought experiment has profound implications for creating a society where harmony is maintained through a sustainable balance of conflict in order to guarantee the shared flourishing of human, nonhuman, and nonliving components of the environment.

DEDICATION

To Hassan, who helped me find my niche.

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CHAPTER 1: INTRODUCTION

"Let us return to the state of nature, and consider men as if but even now sprung out of the earth, and suddenly, like mushrooms, come to full maturity, without all kinds of engagement to each other."[1]

Political philosophy and theory have largely been limited to discussions regarding humankind's difference, rather than similarity, to other organisms and non-living objects. Indeed, most theories that do provide comparison do so at the expense of all that is not human; humans are at the apex of the constructed hierarchy, and the world is theirs to do with as they please. However, not all humans take on a specifically unique role in the work of political philosophers. In Western thought, it is men who bear this special role—not women, not people of color—and those who are excluded from this distinctive position are often compared to non-humans in order to signify their less prestigious position, or they are omitted altogether. It is in these omissions and comparisons that this work seeks to explore the connection between humans and non-humans, as well as the effects these have had on the way the world is understood and structured at present.

Human nature remains entangled in these discussions. Depending on the theorist, humans are social or asocial, competitive or cooperative, self-or-group-centered. Hobbes, in particular, asserts that humankind is distinctly violent. In the absence of government,

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[1] Thomas Hobbes, *Man and Citizen (De Homine and De Cive)* (Indianapolis: Hackett Publishing Company, Inc., 1991), 205.

people are in a constant state of war for life and resources[2]. They are not, however, in a constant state of fighting but a constant state of readiness to fight, fearing for the loss of the resources they had already won and seeking more power to both defend and fulfill their ongoing needs[3]. Nature, then, is relegated to the inactive position of resource, at the mercy of humanity's constant hunger and expansion.

Despite its integral role as the very setting within which humanity exists, nature itself is not necessarily given precedence. At best, nature is coincidentally the location of human-centered development, offering some amount of danger and security simultaneously. Arguably at worst, nature is an exploitable resource that allows humankind to accumulate power, wealth, and prestige. Although past philosophers did not produce works directly related to nature alone, present work is being done in the field of environmental political theory. By examining the connection between nature and humanity and the intersection between political theory and environmental politics, environmental political theory seeks to broaden understanding about the role of nature and humanity as well as the conflicts between them. Nature, despite its understated role in Western political theory, actively shapes and is shaped by humanity's progress.

The interconnection and balance between nature and humanity occupy various fields of thought. Notably, the Gaia Hypothesis addresses the tendency for Earth's organic life processes to seek a homeostatic balance, namely through cyclical processes

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[2] Thomas Hobbes, *Leviathan: Or the Matter, Forme, and Power of a Commonwealth Ecclesiasticall and Civil*, ed. By Michael Oakeshott (New York: Macmillan Publishing Company, 1962).
[3] Johnathan Wolff, *An Introduction to Political Philosophy*, 3rd ed. (Oxford: Oxford University Press, 2016), 9-12.

such as the water cycle and the maintenance of atmospheric gases[4]. Criticisms aside, the Gaia Hypothesis can function as a lens through which the Earth and its critical processes can be maintained. However, while Lovelock's original work tends to concentrate on the unconscious cycling of nature, this paper concerns itself with the intentional, living connection between humans, nonhumans, and nonconscious aspects of Earth, and the subsequent care that must be taken in order for all to thrive.

This paper seeks to examine the individual and community primarily through the lens of Hobbes' mushroom metaphor. While Hobbes' own use of the mushroom metaphor was inaccurate because he did not have an adequate understanding of mushrooms themselves, mushrooms are an accurate metaphor for a community of individuals in symbiotic relationships to themselves and their surroundings. Subsequently, the political model that has been implemented in the West based on Hobbes' original argument is flawed. Civil society should be communal, caring, and conscious of not only an individual's self but their peers and environment, rather than based on independent self-interest to the detriment of others. This falls in line with some modern arguments in political ecology, ecofeminism, and environmental law.

By providing a discussion on the mycological research that has since been conducted, I will reinterpret Hobbes' individuals as community-oriented before the rise of the Leviathan. I will assert the necessity of this reinterpretation by providing examples of mycorrhizal and mycelium structures and samples from other bodies of work that

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[4] James E. Lovelock and Lynn Margulis, "Atmospheric Homeostasis by and for the Biosphere: The Gaia Hypothesis," *Tellus* 26:1 (1974), 2-10. Lovelock has also published several volumes regarding the Gaia Hypothesis.

incorporate this view of the mushroom into their own conceptualizations. Furthermore, I will put forward my own theory for a mycorrhizal polity, giving the basic framework needed to demonstrate that my thought experiment encourages a more complex, relationship-centered institution than Hobbes' own mushroom metaphor could provide. The mycorrhizal polity made up of a mycorrhizal citizenry, functions as both a descriptive alternative to Hobbes' own thought experiment and as a prescriptive ideology that may be used in order to address the realities of today's deleterious connections between humanity and the rest of the environment. The mycorrhizal polity demonstrates that harmony is not incompatible with conflict and that a sustainable balance can be made in order to guarantee the flourishing of Earth's inhabitants.

This reinterpretation of Hobbes is necessary for understanding what the true nature of civil society might look like had Hobbes' mushroom metaphor been true to mushroom biology. I will include a discussion on the use of nature metaphors and their paradoxical rationality to engage in assertions of political legitimacy—namely that the structure of civil society is both firmly grounded and logical because of its natural roots, and also the arguments that posit the opposite in that the very use of nature in forming the legitimacy of a political institution is wrong, because humankind by nature is not like other nature. Subsequently, I will consider several critiques and implications of a mycorrhizal polity that should be kept in consideration before applying it as a viable alternative to the present reality.

CHAPTER 2: LITERATURE REVIEW

Hobbes was not the first to use a nature metaphor to describe society, and he has not been the last. Deleuze and Guattari introduced the concept of the rhizome as a way of thinking rather than arborescence; much like ginger, or a map, rhizomatic thinking has no distinct start or end, so that if a piece is broken off, it continues, the same ginger, the same continuous idea, as the previous piece[5]. All pieces, genres, subfields, species, categorizations are connected infinitesimally and will continue to do so. Arborescence, on the other hand, describes a linear way of thinking, such as the tendency to categorize ideas or concepts into flow charts, genealogical trees—totalizing principles like binarism or dualism. By thinking rhizomatically, one can connect concepts across subfields, as this paper seeks to do by engaging in connections between political philosophy, mycology, and constructions of political legitimacy based on assumptions about nature, amongst other concepts.

Using Deleuze and Guattari's work as a springboard, prominent social scientist Cristina Beltrán engages with rhizomatic versus arboreal readings of *Latinidad*, "the sociohistorical process whereby various Latin American national-origin groups are understood as sharing a sense of collective identity and cultural consciousness"[6]. Previous arguments engage with *Latinidad* in an arboreal manner, where the 'trunk' constitutes the Spanish language, religion, class consciousness, and/or the shared

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[5] Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (London: The Athlone Press Ltd, 1988).
[6] Cristina Beltrán, *The Trouble with Unity: Latino Politics and the Creation of Identity (*New York: Oxford University Press, Inc., 2010), 4.

experience of discrimination (with each Latino pan-ethnicity having its own taproot). Beltrán, however, offers an alternative rhizomatic view that *Latinidad* has no fixed center as it can start up new lines of action where they were once broken or shattered, which allows *Latinidad* to be understood as a "…practice of becoming that understands itself in terms of circulation rather than arrival or completion"[7]. Beltrán's argument offers a foundation for contemplation on how societies might be visualized through the rhizome, rather than the chronological or typographical tree.

Similarly, Nicholas Tampio combines both Deleuze and Guattari's rhizome conceptualization along with Beltrán's *Latinidad* rhizome usage to offer a suggestion for the usefulness of new, potentially confusing academic jargon. Although the introduction of new philosophical concepts like the rhizome may prove confusing to some and easily manipulated by others, Tampio asserts that many commonly used conceptual phrases such as "paradigm shift" or "electoral realignments" were once solely academic, and while scholars should typically write for reader understanding, we should welcome technical terms and neologisms that are clearly conveyed[8]. This allows not only for the spread of the terms across fields but also for the commencement of alternative research lenses that bring forward new ways of understanding, particularly within the social sciences and philosophy.

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[7] Beltrán, *The Trouble with Unity*, 164-68.
[8] Nicholas Tampio, "Stuck on one idea of truth or beauty? Rhizomes can help," *Aeon,* edited by S. Haselby. published May 9, 2017, https://aeon.co/ideas/stuck-on-one-idea-of-justice-or-beauty-rhizomes-can-help

Political science and philosophy have not been the only fields of study that have utilized 'natural' metaphors to conceptualize theories. Within sociology, several theorists have used 'organic' frameworks. Charles Horton Cooley, drawing from Darwin and biological evolution, provided a line of social thought that defined society as "…a living whole, or organism, composed of differentiated members, each of which has a special function"[9]. In his book, *Social Organization: A Study of the Larger Mind*, Cooley discusses the necessity of organization and the collective cooperation between individuals and society[10]. By stating that they are inseparable parts of a common whole, he says that "If there is a universal nature in persons there must be something universal in association to correspond with it"[11]. Human nature and behavior are evolutionary in its growing development of the sense of "I", the individual[12], thus placing Cooley's evolutionary viewpoint firmly within the bounds of nature.

Metaphor holds an important role in this paper, and Lakoff and Johnson demonstrate the prevalence of metaphor in society. Asserting that metaphor is an integral way of forming conceptual structures within our minds, imperative for language and for action, Lakoff and Johnson demonstrate that metaphor is impossible to live without; metaphor shapes how we see the world, and is inescapable, though the agreed-upon

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[9] Randall Collins and Michael Makowsky, eds., *The Discovery of Society*, 8th ed. (New York: McGraw-Hill, 2010), 146-47.
[10] Charles Horton Cooley, *Social Organization: A Study of the Larger Mind* (New York: Charles Scribner's Sons, 1909).
[11] Cooley, *Social Organization*, 36.
[12] Collins and Makowsky, *The Discovery of Society*, 147.

metaphors within each culture may shift and change with time[13]. In discussing how constructed metaphors are grounded, Lakoff and Johnson discuss the human as an animal: both fight for food, sex, territory, control, etc., but as a rational animal, humans have constructed metaphorical institutions—argument is war—that possess the same attributes as a physical fight without the physical consequences[14]. The metaphors we live by are "grounded in our knowledge and experience…"[15]. Therefore, as the mushroom metaphor is introduced in theory as highly individualistic, competitive individuals, Western society perpetuates this in its institutional structures, which cyclically create knowledge and experience of how and why to be highly individualist, competitive individuals. The metaphor becomes the reality.

In *The Nonhuman Turn*, a variety of authors call attention what they see as the nonhuman turn. The nonhuman turn "…insists…that 'we have never been human' but that the human has always coevolved, coexisted, or collaborated with the nonhumans—and that the human is characterized precisely by the indistinction from the nonhuman"[16]. This provides a different foundation for seeing the world: rather than agreeing with social constructivism, the nonhuman turn challenges some of its key assumptions, such as "…the agency, meaning, and value of nature all derive from cultural, social, or

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[13] George Lakoff and Mark Johnson, *Metaphors We Live* By, (Chicago: The University of Chicago Press, 1980).
[14] Lakoff and Johnson, *Metaphors We Live By*, 62.
[15] Lakoff and Johnson, 63.
[16] Richard Grusin, ed., *The Nonhuman Turn* (Minneapolis: University of Minnesota Press, 2015), ix-x.

ideological inscription of construction"[17]. In a connection to Deleuze and Guatarri, the nonhuman turn encompasses human affect systems, both bodily and somatic, explaining that these affect systems are nonhuman, but both cats and humans can possess affectivity, as well as things[18]. This comparison is important when considering the academic and philosophical tendency to establish humanity as distinctly unique in a sea of nonhumanity. The nonhuman turn gives a name and attention to the conceptual disconnect that assumes that humanity is wholly separate from all nonhuman entities and that humanity possesses aspects of nonhumanness while being human.

Hobbes' use of metaphor, despite his statement that metaphors are deceptive and an abuse of speech[19], ironically plays an important role in the construction of his theory. The syllogism he builds to argue for the logistic superiority of science is ironically undermined by his own use of metaphors. As interpreted by Terence Ball, metaphors, tropes, loosely defined terms, and figurative speech are all forms of sedition, according to Hobbes; conceptual confusion would then lead to political chaos[20]. The citizens must have agreed upon definitions, and describing something as another leads to potential miscommunications, particularly offensive because the authority of such words derive from philosophy itself, and unless the citizenry purges itself of these abuses of speech, they are doomed to fail in their scientific endeavor for a secure polity[21]. Paradoxically, the *Leviathan* itself functions as a metaphor, a thought experiment for which Hobbes

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[17] Grusin, *The Nonhuman Turn*, xi.
[18] Grusin, *The Nonhuman Turn*, xvii.
[19] Hobbes, *Leviathan*, 34.
[20] Terence Ball, "Hobbes' Linguistic Turn," *Polity* 17:4 (1985): 753.
[21] Ball, "Hobbes' Linguistic Turn," 754-55.

imagines a state of nature leading to a civil society construction named for a beast, while simultaneously using a metaphor, simile, and other figures of speech to create this vision for his readers.

Jess Keiser, in his work *Very Like a Whale*, points out that Hobbes' peers often criticized Hobbes about his assertion that everything in the universe is 'Body', and wondered if Hobbes could distinguish between Body that thought and reasoned and Body that was inert and mute, like stones; this lead to questions wondering whether Hobbes believed the "Looking-Glass saw, and the Lute heard"[22]. Subsequent criticisms from one of Hobbes' earliest critics, John Bramhall, argued that Hobbes' materialism dictated that humans and things were thus indistinguishable, as the 'natural compulsion' that drove humans to act rendered them passive, and therefore absolved humans from the consequences of their actions[23]. Keiser, however, addresses Hobbes as a satirist, and postulates that the seeming inconsistency of Hobbes' platform on metaphor stems from his criticism of those who read metaphors literally, those 'puzzled philosophers' that read scripture as though both sides of the metaphor were the same; to Hobbes, metaphor is understandable when thought of philosophically, because metaphor is how the mind makes sense of the information gathered by the body, and therefore is a natural by-product of the dynamic thinking matter[24]. Keiser's argument allows for recognition that Hobbes distinguished between metaphorical interpretations, thereby releasing him from

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[22] Jess Keiser, "Very Like a Whale: Metaphor ad Materialism in Hobbes and Swift," *Modern Philology* 113 (2015): 203.
[23] Keiser, "Very Like a Whale," 204.
[24] Keiser, "Very Like a Whale," 212-216.

criticism despite his earnest use of metaphor in the same writings where he seeks to purge figurative language from linguistics[25]. Given this explanation, while recognizing that Hobbes may have indeed thought of his own metaphors as clear and as having shared meaning with his reader, this paper will operate under the assumption that Hobbes' mushroom metaphor does not agree with scientific fact regarding mushrooms, though it may match with common thought (which agrees that mushrooms spring from nowhere and are indeed atomistic). Therefore, Hobbes' metaphor requires clarification and a reinterpretation under the new information that has become available about mushrooms since the time of his writing.

That being said, Robert Sapolsky provides some interpretation regarding the brain's capacity to handle metaphor and distinguish between metaphorical and literal. Because different parts of the brain do not distinguish between literal and psychic pain, experiencing visceral and moral disgust, physical and moral purity, physical sensation and interpretation of another's personality, metaphor is a dangerous way to convince someone that an Other does not have the same value as one's self—simply by engaging the brain (without the need to engage the thought)[26]. As Sapolsky notes, engaging a populace with the idea that an Other is less than human, something disgusting, a lesser being, and the dehumanization and pseudospeciation leads to not only categorical Othering but encouragement to eradicate the lesser, disgusting thing. In terms of Hobbes, metaphorical 'mushroom men' can be interpreted as an Other by virtue of their relation to

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[25] Hobbes, *Leviathan,* "Of Speech," 33-40.
[26] Robert Sapolsky, "Metaphors We Kill By," in *Behave: The Biology of Humans at Our Best and Worst* (New York: Penguin Press, 2017).

mushrooms, which grow in damp, dark places (often decaying bodies of organisms), leading to a knee-jerk rejection of their authenticity as a thought experiment human. It could also mean that Hobbes' engagement with Othering animals may lead to irresponsible practices concerning animals because their nonhuman nature does not merit them the respect granted to a fellow human. Hobbes, by using a metaphor, engaged a part of the brain that does not discern between literal and metaphorical, though the mind may do so separately; this should be kept in mind, particularly when mulling over his own perceived reality that some people engage with linguistic metaphors literally while others do not—the brains of these people do not actually differentiate them.

Other scholars have found issue with Hobbes descriptions within his metaphor of the state of nature. John M. Meyer addresses Hobbes' writings on nature and the problems that stem from his definition. By delineating "nature" as everything that is matter in motion, including thoughts, senses, and will as 'motions of the mind', Hobbes was able to organize everything from this origin[27]. However, Hobbes is unable to give *quality* to nature—it is contentless[28]. Furthermore, by centering the body as the central reality of nature, but also asserting that there are no such things as universalities, Hobbes severely undercuts his own logic[29]. Meyer provides further discussion on the limitations of Hobbes' definition of nature when applied to the sovereign and natural laws, and how in order to bridge that gap between the state of nature and politics one must reject a linear

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[27] John M. Meyer, *Political Nature: Environmentalism and the Interpretation of Western Thought (*Cambridge: The MIT Press, 2001), 60.
[28] Meyer, *Political Nature*, 61.
[29] Meyer, *Political Nature*, 61.

progression from one to the other and acknowledge that, rather than being derived from nature and human nature, Hobbes' political arguments have been formed as a dialectic between the two[30]. This article demonstrates the tenuous relationship that Hobbes has formed in his argument connecting nature and civil society, and provides examples of where Hobbes' arguments do not provide adequate *natural* explanations, but rather *mechanistic* ones.

This paper is not the first to make comparisons between people and mushrooms, as there are predecessors to this metaphor. Paul Sagar brings up this metaphor in regards to Hobbes' construction of the family and familial power dynamics, pointing out that the purpose of the mushroom representing man, fully developed and springing from nothing, is a perfect representation of Hobbes' theory of how man came from the state of nature to civil society; the theory came to be not to demonstrate man's development in the state of nature, but his exit from it, and so the mushroom, suddenly in existence, fits this snapshot image of man before his evolution[31]. Theodore Christov discusses the temporality issue of the mushroom metaphor as well, describing Hobbes' critics' idea of the state of nature as descriptive and therefore anti-Scriptural as a "common intellectual error"[32]. The mushroom metaphor is a thought experiment, as Sagar points out. Although Christov describes the 'nature' the 'mushroom men' live in as a heuristic device to allow for an abstraction in thinking, he also, however, views Hobbes' 'nature' (and the mushroom

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[30] Meyer, *Political Nature*, 79.
[31] Paul Sagar, "Of Mushrooms and Method: History and the Family in Hobbes's Science of Politics," *European Journal of Political Theory* 14:1 (2015): 98-117.
[32] Theodore Christov, *Before Anarchy: Hobbes and His Critics in Modern International Thought* (New York: Cambridge University Press, 2015), 52.

men by consequence) as a historical possibility of human nature: "…nature's historical possibility does not contradict its heuristic use"[33]. Michael Jackson, while recognizing that Hobbes' state of nature and mushroom metaphor are a function of a thought experiment, points out that Hobbes (as well as Rawls) suffer under a misconception that a universal masculine morality is superior to the feminine morality of particularity; the unsocial nature of people in this thought experiment misconstrues our conceptual understanding by assuming that the only pathway to reason is through a masculine morality, even though this morality does not apply to everyone (and particularly because it is a Western construction)[34]. Furthermore, Christine Di Stefano addresses Hobbes' mushroom metaphor as a method of affirming masculine superiority and independence from the feminine, as it removes the need for females and their control over reproduction and traditional expectations of socialization from the state of nature[35].

Not all of these conversations pertain directly to Hobbes and his 'mushroom men'. Yrjö Engeström, for example, discusses communities of practice in relation to mycorrhizal structures. Communities of practice, bounded by locality and membership, defined by a single center of skill or practice, with centripetal movement from periphery (novice) to center (master), function like mycorrhizae in models like Open Source

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[33] Christov, *Before Anarchy*, 52-3.
[34] Michael Jackson, "Mushrooms, Like Men?" *Hobbes Studies* 13:1 (2000): 46-57.
[35] Christine Di Stefano, "Masculinity as Ideology in Political Theory: Hobbesian Man Considered," *Women Studies International Forum* 6:6 (1983): 633-44.

technological sharing and grassroots political activism[36]. Paul Stamets, in his book *Mycelium Running: How Mushrooms Can Help Save the World*, shares concepts of 'mycorestoration', utilizing the mycorrhizal fungi as treatments for pollution, insect control, and the overall improvement of the health of agricultural systems within and outside of human habitation[37]. Both provide uses for the mycorrhizal system in areas that are uncommonly connected with organic structural solutions.

There is a host of recent publications regarding the relationship between humans and animals, which are not targeted towards an academic audience. Instead, these are marketed towards the average member of society, so that the information might reach a wider variety of people. These books include books like those by Richard Sapolsky, mentioned early, that merge his work in biology and neurology to draw comparisons and similarities between humans and animals like primates, zebras, voles, snakes, and spiders (to name a few)[38]. Besides his work on metaphor, Sapolsky works to explain human and animal processes by demonstrating the similarities in biological and neurological systems between humans and nonhumans. Sapolsky's work is useful for his comprehensive work

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[36] Yrjö Engeström, "From Communities of Practice to Mycorrhizae", in J. Hughes, N. Jewson & L. Unwin (Eds.), *Communities of Practice: Critical Perspectives* (London: Routledge, 2007): 41-54.

[37] Paul Stamets, *Mycelium Running: How Mushrooms Can Help Save the World* (Berkeley: Ten Speed Press, 2005).

[38] Robert Sapolsky, *Behave: The Biology of Humans at Our Best and Worst* (New York: Penguin Press, 2017); Robert Sapolsky, *The Trouble with Testosterone*: *And Other Essays On The Biology Of The Human Predicament* (New York: Touchstone, 1998). His other titles include *Monkeyluv and Other Essays on Our Lives as Animals*; *A Primate's Memoir: A Neuroscientist's Unconventional Life Among the Baboons*; *Why Zebras Don't Get Ulcers: A Guide to Stress, Stress-Related Diseases, and Coping*; *Stress, the Aging Brain, and the Mechanisms of Neuron Death*.

on the bodily connections between humans and animals, which shows a distinct chemical and biological similarity in the way humans and other animals react to stimuli. Paleoanthropologist Pat Shipman writes on what she believes is humankind's greatest strength: our propensity to domesticate and care for other animals. Shipman draws on the fossil record as well as research on present-day animals and people to illustrate her theory that humanity developed sophisticated tools and enhanced communication skills as a result of intimate relationships with animals[39]. Shipman's work provides one example of the interconnection of humanity with other animals and the necessity of one for the other. Clarissa Pinkola Estés, in *Women Who Run with Wolves*, writes a book of a different style, meant to incite women to find the 'instinctual, natural woman' buried within them by patriarchal domination[40]. By intentionally summoning a spiritual element, Estés urges women to find the part of them that is still a part of nature, so that they may become their true fierce, intuitive, strong selves.

Other books take a more specified approach by choosing a particular group of animals to examine for their human-animal connection. Jennifer Ackerman, in *The Genius of Birds*, describes the intelligence and behaviors of birds that put them on par with primates, whom humanity considers to have near human-sentience; she notes the capacity for birds to make and use tools, navigate social situations, their sense of

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[39] Pat Shipman, *The Animal Connection: A New Perspective on What Makes Us Human* (New York: Norton and Company, Inc., 2011).
[40] Clarissa Pinkola Estés, *Women Who Run With the Wolves: Myths and Stories of the Wild Woman Archetype* (New York: Ballantine Books, 1992).

aesthetics, the way they communicate, and their spatial and temporal ingenuity[41]. *The Hidden Lives of Owls: The Science and Spirit of Nature's Most Elusive Birds* by Leigh Calvez details not only the lives of the owls themselves, but the life of the owl as a facet of human society around the world, be it through myth, religion, superstition, or physical presence and how owls and people are interwoven in the fabric of society[42]. Though birds are not the closest relatives to humans genetically, these two works cross the genetic divide and assert the strength of the connection between birds and humans.

Similarly, Johnathan Balcombe and Sy Montgomery write on the lives of underwater creatures, simultaneously enlightening the readers about the creatures and also about themselves. Balcombe's *What a Fish Knows* dives into what we assume we know about fish, and reveals that they are more similar to humans than we know: they create lifelong bonds, courtship rituals, hunt cooperatively, deceive one another, and punish wrongdoers[43]. In *The Soul of an Octopus*, Montgomery follows four different octopuses in an effort to construct an alternate reality—that of an octopus—and by putting human experience in the shoes of an octopus, Montgomery rediscovers the earth that we all share[44]. Like the books covering birds, these two attempt to bridge the human consciousness of our selves and how we see the world with comparisons to creatures very unlike ourselves in order to demonstrate the shared world we inhabit.

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[41] Jennifer Ackerman, *The Genius of Birds* (New York: Penguin Books, 2016).
[42] Leigh Calvez, *The Hidden Lives of Owls: The Science and Spirit of Nature's Most Elusive Birds* (Seattle: Sasquatch Books, 2016).
[43] Johnathan Balcombe, *What a Fish Knows: The Inner Lives of Our Underwater Cousins* (New York: Scientific American / Farrar, Straus, and Giroux, 2016).
[44] Sy Montgomery, *The Soul of an Octopus: A Surprising Exploration into the Wonder of Consciousness* (New York: Atra Paperback, 2016).

Still other works connect the knowledge of indigenous peoples regarding nature over time to the present day; these works combine a history of indigenous suffering with the assertion of their knowledge as equally valid as any other form of knowledge. Jon Young describes the lives of birds and how indigenous peoples have studied and understood birds far longer than science; with science catching up, Young shows that the connection humanity has with birds can show a deeper connection to the environment and one's self[45]. Similarly, Robin Wall Kimmerer makes a return to when people considered plants and animals their greatest teachers, and highlights the lessons that humanity can draw from nature in an effort to bring indigenous people's knowledge to the forefront of a new movement towards wider ecological consciousness[46]. In a previous book, *Gathering Moss*, Kimmerer brings the life of mosses to the forefront, relating the interdependence of moss to the lives of fish, trees, birds, and humans while drawing on her Native American heritage[47]. These books are only a sample of those seeking to combine modern science with indigenous knowledge and wisdom, seeking to confirm the legitimacy of different worldviews where each part of the world is much more dependent than the present reality would have us believe.

Charles Foster, alternatively, sought to bring a new example to attempts to understanding the interconnection of human and animal life. In order to shed light on the

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[45] Jon Young, *What the Robin Knows: How Birds Reveal the Secrets of the Natural World* (New York: Mariner Books, 2013).
[46] Robin Wall Kimmerer, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants* (Minneapolis: Milkweed Editions, 2013).
[47] Robin Wall Kimmerer, *Gathering Moss: A Natural and Cultural History of Mosses* (Portland, Oregan State University Press, 2003).

nonhuman other, Foster chose to live like a badger, an otter, a fox, a deer, and a swift, using his experience to draw conclusions about what living as a nonhuman is like[48]. His experience, though unorthodox, provides a new lens for the reexamination of the human experience, as Foster attempts to transcend his human limitations to understand the life of a nonhuman.

Plant-life takes a considerable role in other works, serving the same role that animals take in the previously discussed works. *What a Plant Knows* by Daniel Chamovitz seeks to connect genetics with experience in plant lives, illustrating to readers the diversity in sense and preference that plants can have, much like humans[49]. David George Haskell's *The Forest Unseen* and *The Songs of Trees* explores the profound interspecies connections that the forest depends on, as well as the interspecies connections between humanity and trees, showing how the actions of each species affects the other's reactions and overall quality of life[50]. Sharon Blackie takes a personal journey in *If Women Rose Rooted*, investigating the history, mythology, and femininity of women, and advocates for a return to a moment where women and nature were together, and to use that togetherness, natural power, to improve the world[51]. In several works, Peter Wohlleben, best known for *The Hidden Life of Trees* but also the author of *The*

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[48] Charles Foster, *Being a Beast: Adventures Across the Species Divide* (New York: Metropolitan Books, 2016).
[49] Daniel Chamovitz, *What a Plant Knows: A Field Guide to the Senses* (Oxford: Oneworld Books, 2012).
[50] David George Haskell, *The Songs of Trees: Stories from Nature's Great Connectors* (New York: Penguin Random House, 2017); David George Haskell, *The Forest Unseen: A Year's Watch in Nature* (New York: Penguin Books, 2012).
[51] Sharon Blackie, *If Women Rose Rooted: A Journey to Authenticity and Belonging* (Denmark: September Publishing, 2016).

Inner Life of Animals and the upcoming *The Weather Detective*, details the complexities that tie trees together—mycorrhizal fungi and arboreal root systems working together to communicate across distance and species, a process that attempts to secure the survival of the forest as a whole—and also provides insight into the minds of animals, including their feelings of love and grief; his upcoming book intends to give readers a closer look at how humanity and the weather used to be more in tune, and that the closeness we once had with this abiotic sense of our environment is something to which we should return[52].

A common thread unites many of these diverse works: they come from individuals seeking knowledge from nature. Though their motivations range from personal enlightenment, to further knowledge about the creatures or land itself, these works ultimately seek to know more about the world in terms of a combined lens where nature and the self are intertwined—knowledge of one can give knowledge about the other. This wave of literature contributes to a profound shift in historical understandings of humanity and the rest of the world, one that is imperative for humanity to truly respect that we are not the sole inhabitants of the world. The urgency that is reflected in *The Unnatural World: The Race to Remake Civilization in Earth's Newest Age* by David Biello[53] and countless other publications demonstrate an understanding of this interconnection and the necessity for humanity to swiftly work to correct old wrongs and

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[52] Peter Wohlleben, *The Hidden Life of Trees: What They Feel, How They Communicate; Discoveries from a Secret World* (Berkeley: Greystone Books, 2016); Peter Wohlleben, *The Inner Life of Animals: Love, Grief, and Compassion* (Berkeley, Greystone Books, 2017); Peter Wohlleben, *The Weather Detective: Rediscovering Nature's Secret Signs* (Boston: Dutton, 2018).

[53] David Biello, *The Unnatural World: The Race to Remake Civilization in Earth's Newest Age* (New York: Scribner, 2016).

to repair the present in hopes that the reparations will be sufficient enough to protect the world and its inhabitants.

CHAPTER 3: HOBBES AND POLITICAL NATURE

Political Nature

Nature has been a point of contention in the Western world, whether 'nature' is meant to be the inherent characteristics and behavior of humanity, the surroundings that we inhabit, or the environment, supposedly untouched by human hands, that is filled with plants and animals. The injection of politics into this discourse raises more questions: what is our political nature? Are humans the only living creatures to organize along political lines? If animals organize, is it truly politic? And can humans behave outside political nature, if it is inherent and part of our genetic makeup? Political theory examines human nature as one of the bases of its foundations. A main point of disagreement is whether or not humans are inherently competitive or cooperative with each other; it also examines which sex or age of a person has which particular propensity.

One school of thought considers humanity to be naturally cooperative. Aristotle, for example, theorized that although individuals might have self-interest, these needs were met through the hierarchical structures of patriarchal family and leadership—women, children, and 'natural slaves' lacked the capacity for correct reasoning, and as long as a man had correct reasoning, the self-interests of all would be met[54]. Men, naturally, have a position of power and a superior mind that allows for their virtuosity to make decisions in the group self-interest, whether or not the women, children, or 'natural slaves' know these decisions are supposed to be beneficial to them or not.

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[54] Avi Tuschman, *Our Political Nature: The Evolutionary Origins of What Divides Us* (New York: Prometheus Books, 2013), 300.

Around the same time, a Chinese philosopher named Mencius (Yàshèng Mèngzǐ) wandered China with a different yet similar message. He spread the doctrine of the 'four sprouts' that were the innate goodness of an individual: a sense of commiseration, a sense of shame, a reverential attitude toward others, and a sense of right and wrong[55]. In order for these 'sprouts' to properly become healthy plants, they must be cultivated in a healthy ethical environment—the family—which by extension, reached all the way to the leader of the society who would lose the 'mandate of heaven', political legitimacy, if he did not have a solid ethical foundation and practice[56]. The family remains a key political unit, as an educator of children who become ethical, upstanding citizens who expect to be led by a ruler with the same foundational ethics but with the approval of higher powers.

Later, John Locke conceptualized the infamous *tabula rasa*, the mind as a blank slate. He postulated that all people were born with equal faculties, and were deserving of 'natural rights' to life, liberty, health, and property, uprooting the traditional understanding that Christian God granted monarchs sovereignty[57]. These people lived in a 'state of nature', where they had enough reason and tolerance for others to respect their natural rights; however, because people also have the capacity to be unjust to their fellows, Locke posits that these people cooperated to form a government for their protection, ceding some of their power to protect their natural rights[58]. Locke also dictated that men were not naturally women's superiors, and instead, they gained the

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[55] Tuschman, *Our Political Nature*, 300-301.
[56] Tuschman, 300-301.
[57] Tuschman, 301.
[58] Tuschman, 301.

authority they had by virtue of Eve's greater sin, and subsequently greater punishment, in the fall from Eden; women, although they were not equals to men in marriage or rights—their burden, as the weaker sex[59]. Locke's conception of equality followed women from the state of nature to the covenant of marriage, but did not guarantee them true equality due to the unequal distribution of strengths (of mind, body, etc.) that his contemporaries believed were true of men and women.

One of the main tenets of Locke's theory regarded property, which is important to this paper's discussion of natural environment and the interaction between it and humanity. Locke considers the earth and all that is in it as belonging to mankind in common, with an individual's labor giving him the right to private property.[60] The earth is given to mankind to use, rather than to care for. Whatever is labored upon is now considered private property, with some restrictions—whatever is being used from the earth may not be more than one individual can use or consume—that are put in place to ensure that each individual does not overstep and infringe upon what another individual might need, or produce waste[61]. Each individual may not take more from the earth than they need to survive, but the earth is viewed as a natural subject of man.

Jean-Jacques Rousseau also conceptualizes the state of nature, but has fundamental disagreements with Locke on what the state of nature entails. Law, property,

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[59] Chris Nyland, "John Locke and the Social Position of Women", University of Wollongong, Working Paper 90-6, 1990.
[60] John Locke, "Of Property," in *Privatization: Critical Perspectives on the World Economy, Volume 1*, ed. George K. Yarrow and Piotr Jasiński (New York: Routledge, 1996), 61-71.
[61] Locke, "Of Property".

and morality are constructions made after the state of nature has been left; people were free and equal, and there was little in terms of cooperation or conflict[62]. People did not form lasting bonds, and lived entirely in the present, which allowed them to live without overstepping their own needs and desires, as each one was met as it was encountered[63]. Much like animals, they largely lacked moral and rational faculties, although they did have the capacity to feel pity for other's suffering and an instinct to survive[64].

Conversely, there are those who believed that human nature was inherently competitive. This school of thought is where Hobbes' theory regarding the state of nature and the progression into the Leviathan come into being. Because individuals in the state of nature desire power and riches in addition to the necessities of life, life is known to be "…nasty, brutish, and short"[65]. Hobbes believes that those in the state of nature are equal in mental and physical capacity, in that the weakest individual could kill the strongest by outwitting them or by forming a coalition; even those with nothing must fear, because they are vulnerable to preemptive attack from those who seek to protect the wealth they have accumulated[66].

Hobbes

Thomas Hobbes, known for his theories regarding social contracts, provides a metaphor for the purpose of describing the men of his theories. Although it is not the only

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[62] Jean-Jacques Rousseau, *The Social Contract and The First and Second Discourses*, ed. Susan Dunn (New York: Vail-Ballou Press, 2002).
[63] Rousseau, *The Social Contract and The First and Second Discourses*.
[64] Rousseau, *The Social Contract and The First and Second Discourses.*
[65] Hobbes, *Leviathan*, 100.
[66] Johnathan Wolff, *An Introduction to Political Philosophy*, 3rd ed. (Oxford: Oxford University Press, 2016), 8-33.

comparison Hobbes gives, this paper will address this metaphor as an integral addition to the way Hobbes conceptualized men. The metaphor, in his chapter "Of the Rights of Lords over Their Servants", reads as follows: "Let us return to the state of nature, and consider men as if but even now sprung out of the earth, and suddenly, like mushrooms, come to full maturity, without all kinds of engagement to each other"[67]. This description of man has come under scrutiny by others regarding the paradoxical way Hobbes also describes family[68], for reasons to be discussed.

Man, the individual, is as a mushroom, emotionless, asexual, and unaffected, springing up fully formed without need for others or for cultivation[69]. This metaphor implies that men are isolated from each other, with no need for society, and are fully self-sufficient while simultaneously being in constant direct conflict with one another for resources. Men have no need for one another's company; the presence of others may only give man grief, not pleasure[70]. As Hobbes outlines, all men are equal regardless of their individual strength and wit, and are united in their constant and restless desire for power[71]. Men are by nature equal, and with a constant desire for more, they are in direct conflict with one another.

Hobbes elaborates on this conflict between individuals, describing 'the state of war' that all are constantly within. When one individual desires the same thing as

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[67] Thomas Hobbes, *Man and Citizen (De Homine and De Cive)* (Indianapolis: Hackett Publishing Company, Inc., 1991), 205.
[68] Theodore Christov, *Before Anarchy: Hobbes and His Critics in Modern International Thought* (New York: Cambridge University Press, 2016), 49.
[69] Theodore Christov, *Before Anarchy*, 51-56.
[70] Hobbes, Leviathan, 99.
[71] Hobbes, *Leviathan,* 80.

another, they are enemies, and their only option to attain their end goal is to destroy or subdue the other[72]. In the state of nature, outside of a civil state, man is constantly at war, not only against an individual who desires the same thing as him, but also against every man[73]. Hobbes asserts that individuals may undertake any action to attain the goal, as outside the civil society, there is no right or wrong, justice or injustice—there is only the cardinal virtues of force and fraud[74], which one may use to pursue whatever one desires, as he has a right to everything, including to another individual's body[75]. There are no friends or kinship ties to bind one individual to another or to prevent violence against any individual.

Hobbes gives few options for an individual to remove oneself from war and to enter into 'peace'. He argues that what most inclines man to peace is the fear of death[76]. Therefore, the only things that might stop a conflict from occurring would be one individual's fear of death from the other. Despite each individual's equality, wit and strength may be used to defeat the other if they must face off directly. Hobbes further outlines laws of nature, of which are "to seek peace, and follow it" and "by all means we can, to defend ourselves"[77]. Peace may be found in the form of contracts. There form the basis of his argument for individuals' exit from the state of nature, in which their lives

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[72] Hobbes, *Leviathan,* 98-99.
[73] Hobbes, *Leviathan,* 100.
[74] Hobbes, *Leviathan,* 101.
[75] Hobbes, *Leviathan,* 103.
[76] Hobbes, *Leviathan*, 102.
[77] Hobbes, *Leviathan,* 104.

would be "…solitary, poor, nasty, brutish, and short"[78] as a result of their constant competition and uncertainty, into the protection of civil society.

One such arrangement that Hobbes describes is that of the family, the hierarchy of paternal nature. Infants, by default, fall under the dominion of the mother, as she nourishes and protects them; however, were the mother to abandon her infant and another acquire them, the other would now be their master, as the mother had relinquished her right over them[79]. However, this natural dominion is overturned if the mother is the subject of the father or another man; as the infant cannot have two masters, the infant is under the dominion of the father as well[80]. Dominion may be consented to, or it may come via conquest (and subsequent consent), and the subject of the agreed-upon contract is then the servant of their master, whether they are the mother of their mutual child or the conquered opponent[81].

Hobbes definitively gives the individual certain natural attributes within the state of nature, which then follow the individuals into the civil society that they form, the "Leviathan". The state of nature is that which precedes civil society, and individuals must consent to its creation and continuance much as they would consent to contracts between individuals:

> The only way to erect such a common power, as may be able to defend them from the invasion of foreigners, and the injuries of one another, and thereby to secure

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[78] Hobbes, *Leviathan,* 100.
[79] Hobbes, *Leviathan*, 152-53.
[80] Hobbes, *Leviathan,* 152-53.
[81] Hobbes, *Leviathan,* 153-54.

> them in such sort as that by their own industry and by the fruits of the earth they may nourish themselves and live contentedly, is to confer all their power and strength upon one man, or upon one assembly of men, that may reduce all their wills, by plurality of voices, unto one will: which is as much as to say, to appoint one man, or assembly of men, to bear their person; and every one to own and acknowledge himself to be author of whatsoever he that so beareth their person shall act, or cause to be acted, in those things which concern the common peace and safety; and therein to submit their wills, every one to his will, and their judgments to his judgment[82] .

Once the individuals in a state of nature submit to the sovereign, they are then part of a civil society that gives protection via the sovereign's rule in the common interest. The sovereign holds greater power than all of his subjects, but his subjects remain ultimately equal[83]. However, though his subjects are bound by their contractual agreement to abide by his wishes, if the sovereign is no longer able to protect them, either because it is not in the sovereign's interest or because he does not have the capacity, then the subjects' obligations to the sovereign no longer stand[84]. The civil society works with both parties in tandem, the sovereign depending on the subjects to hand over their power to him in exchange for the subjects' protection.

However, if Hobbes' individuals are by nature in conflict with one another, then their mushroom-like, atomistic nature follows them into the Leviathan. Rather than a

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[82] Hobbes, *Leviathan,* 146.
[83] Hobbes, *Leviathan,* 141.
[84] Hobbes, *Leviathan,* 167.

close-knit group of individuals invested in the well being of the group as a whole, the Leviathan encompasses a structure composed of self-interested individuals with little perceived need for cooperation beyond the protection that the Leviathan provides via law. The competition, the grief in each other's company, the fear of having less power or standing than another individual are all still tangible threats. Furthermore, the Leviathan exists to protect individuals from each other, not from their natural surroundings or from dangerous animals or conditions; it assumes the violence of humanity from its beginning, and humanity's inability to imagine cooperation amongst itself, much less amongst all living creatures and the environment.

Hobbes stands as an important figure in social contract theory, as consent forms an integral part of his argument. However, Hobbes runs into several other limitations that undermine his theories, regarding who the beneficiaries of his theories are. It has been pointed out before that Hobbes' Leviathan is exclusive to white property-holding males; his position in history ensures an ideology of European Christian superiority[85]. His account is famously scarce of women and children, outside of a brief conceptualization of man's dominance over women in the traditional patriarchal family structure[86]. He provides little explanation for why women would submit themselves to a man, given that matrimonial relations are nonexistent in the state of mature, and he does not address the paradoxical nature of his proposal that men spring up like mushrooms, fully formed, and

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[85] Richard Ashcroft, "Hobbes' Natural Man: A Study in Ideology Formation," *The Journal of Politics* 33:4 (1971): 1076-1117.
[86] Hobbes, *Leviathan,* 152-58.

the idea that mothers actually have dominion over children[87]. Outside of references to men as the superior sex, Hobbes does not provide adequate substantiation for the existence of women and children in the state of nature.

As previously stated, Hobbes gives little consideration to certain groups of people when discussing his theory, in addition to his lack of attention paid to women and children. Hobbes provides examples of people of color, non-Europeans, only to use them as proof to demonstrate that the state of nature is not as unlikely as his critics believe. Hobbes explicitly refers to the indigenous populations in the Americas as the closest living example of his state of nature, describing their lack of government and general savagery[88]. While there is evidence that Hobbes may have referred to indigenous Americans this way as a product of common discourse of the time, there are also arguments that Hobbes himself had some part in shaping the attitudes that regarded the indigenous peoples in the Americas as subhuman[89]. He also references the Amazons' practice of infant gender selection (returning male infants to the men of other countries and keeping female infants to become Amazons) as a distinct example of 'natural' dominion as he describes in the state of nature[90]. Ultimately, the depictions of non-white, non-Europeans are largely negative and paternalistic, and relegate these people as Others

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[87] Christine Di Stefano, "Masculinity as Ideology in Political Theory: Hobbesian Man Considered." Di Stefano provides a provocative point on the gender binary and masculine superiority, stating that Hobbes' method of using a mushroom metaphor provides an excellent way of denying that men are ever nurtured by women.
[88] Hobbes, *Leviathan,* 101.
[89] Richard Ashcroft, "Hobbes' Natural Man", 1089-1095.
[90] Hobbes, *Leviathan,* 152.

that are neither as advanced, mature, or as humanlike as he considered himself and his own fellows.

A final note: Hobbes does little to denote that animals and environment are to be treated with respect. His 'state of nature' refers solely to his conceptualization of a pre-civil society human-centered epoch. When animals are mentioned, they are described as beasts, non-humans, distinct because of their lack of speech, rational thought, and communal organization[91]. Animals are the natural dominion of man, as irrational brutes that may be reduced to servitude, tamed, persecuted, or destroyed[92]. Their only purpose is to exist for the need of man, and their lives are forfeit when confronted with the choice between their survival and man's. Hobbes makes a clear distinction between human and beast by declaring that no covenants may be entered with a beast, as they cannot understand our speech and accept no translation; without mutual acceptance, a covenant cannot be made[93]. At best, they are a tool, and no more than that. Animals do not experience fights for honor and dignity like men, nor do they feel envy or hatred, or make war; their common good does not differ from their private good; they cannot find fault with the administration of their common business like man is capable of; they have voice but no words; they cannot distinguish between injury and damage; and their agreements are natural, rather than artificial, like man's[94]. With Hobbes' science, our inability to

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[91] Hobbes, *Leviathan,* 33, 39, 43, 131-32; Hobbes, *Man and Citizen*, 37, 167-69.
[92] Hobbes, *Man and Citizen,* 209.
[93] Hobbes, *Leviathan*, 109.
[94] Hobbes, *Leviathan*, 131.

communicate with animals is of utter importance, though he does not address why animals should be treated differently than humans who are incapable of reason.

CHAPTER 4: MYCORRHIZAL MULTIPLICITY

The mushroom metaphor itself is an imperative part of this paper's argument. Hobbes, limited by the bounds of scientific inquiry and capacity, offers the mushroom as a symbol of isolation, competition, and asexuality, comparing it to the same traits he sees in the individual man in the state of nature. However, mushrooms are now understood to be more complex; they are exceptionally diverse organisms that remain poorly understood despite their global territoriality[95]. Mycorrhizae comprise of the root-to-root associations of fungi to plants, providing a flow of nutrients to each other. There is variation in the amount of mycorrhizal activity across fungi and plants (through vesicular-arbuscular mycorrhizae), a concept that is still under investigation[96]. Much has been done in the first one hundred years of mycorrhizal research to force recognition that symbiotic relationships are largely universally present in nature[97]. It is this concept with which this paper will directly engage.

Mycorrhizal Citizenry

Hobbes may not have understood the full implications of his use of the mushroom metaphor[98], but for the purposes of this paper, its usage will be embraced, revised, and restructured. While Hobbes' understanding of mushrooms allowed him to choose a

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[95] John Dighton, James F. White, and Peter Oudemans, eds., *The Fungal Community: Its Organization and Role in the Ecosystem,* 3rd ed., (Boca Raton: CRC Press, 2005), 31.
[96] D.J. Read, D.H. Lewis, A.H. Fitter, and I.J. Alexander, eds., *Micorrhizas in Ecosystems* (Cambridge: CAB International, 1992), 26.
[97] Marcel G.A. van der Heijden and Ian R. Sanders, *Mycorrhizal Ecology* (New York: Springer-Verlag Berlin Heidelberg, 2002), 4.
[98] Understandably, as Hobbes created this theory before mycorrhizal research had truly existed.

metaphor that illustrated that political right derived from ratiocination rather than from historical or societal development[99], the mycorrhizal fungi serves as a metaphor for political nature derived from a social and interconnected ecosystem.

There are two main types of mycorrhizal fungi. There are arbuscular or endomycorrhizal fungi, which functions intracellularly with a host plant, or ectomycorrhizal fungi, which functions extracellularly—both connect via the host plant's root system[100]. The endomycorrhizal fungi's hyphae, the thin while filaments (collectively known as mycelium), invaginates the cell membranes of plant root cells[101]. Ectomycorrhizal fungi hyphae do not penetrate the individual root cells of the host plant, but has penetrates the root nonetheless. These connections allow for an exchange: the plant supplies the mycorrhizae with carbohydrates like glucose for energy, and in return, the mycorrhizae shares the water and nutrients that it picks up with greater ease than the plant could by itself[102]. There are even some species of plant, such as those in the genera Orchidaceae, which cannot germinate without the presence of mycorrhizal fungi[103].

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[99] Theodore Christov, *Before Anarchy: Hobbes and His Critics in Modern International Thought* (New York: Cambridge University Press, 2016), 51-52.
[100] Dighton, et. al., *The Fungal Community*; Read, et. al., *Micorrhizae in Ecosystems*; Van der Heijden and Sanders, *Mycorrhizal Ecology*.
[101] Dighton, et. al., *The Fungal Community*; Read, et. al., *Micorrhizae in Ecosystems*; Van der Heijden and Sanders, *Mycorrhizal Ecology*.
[102] Maria J. Harrison, "Signaling in the Arbuscular Mycorrhizal Symbiosis," *Annual Review of Microbiology* 59 (2005): 19-42.
[103] Kullaiyan Sathiyadash, Muthukumar Thangavelu, Uma Eswaranpillai, and Radha Raman Pandey, "Mycorrhizal association and morphology in orchids," *Journal of Plant Interactions* 7:3 (2012): 238–47.

Although once thought to be more harm than help[104], mycorrhizal fungi largely benefit those plants with which it forms a relationship.

In addition to forming connections with individual plants, mycorrhizae also form what is known as a mycorrhizal network, where the mycelium of multiple fungi interconnects. Although (arbuscular) mycorrhizae have low host specificity, the mycorrhizal network may connect any or all given mycorrhizae-compatible plants in an area in a complex overlap of host-fungus species interactions[105]. This network provides an array of minerals and water to the hosts connected to the common mycorrhizal network, which may be distributed unequally intraspecifically, maintaining individual plant competition while simultaneously benefiting the connected plants with increased nutrient uptake[106]. These networks allow the plants that are connected to the mycelium to identify both kin and non-kin plants; preferential nutrient exchange is given to kin, though all organisms connected to the network may benefit from the network's contributions to the carbon cycle[107].

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[104] Nicholas P. Money, *The Triumph of the Fungi: A Rotten History* (New York: Oxford University Press, 2007).
[105] Johnathan Leake, David Johnson, Damien Donnelly, Gemma Muckle, Kynne Boddy, and David Read. "Networks of Power and Influence: The Role of Mycorrhizal Mycelium in Controlling Plant Communities and Agroecosystem Functioning," *Canadian Journal of Botany* 82:8 (2004): 1016-45.
[106] Joanna Weremijewicz and David P. Janos, "Common mycorrhizal networks amplify size inequality in Andropogon gerardii monocultures," *New Phytologist* 198 (2013): 203-213.
[107] Brian J. Pickles, Roland Wilhelm, Amanda K. Asay, Aria S. Hahn, Suzanne W. Simard, and William W. Mohn, "Transfer of ^{13}C between paired Douglas-fir seedlings reveals plant kinship effects and uptake of exudates by ectomycorrhizas," *New Phytologist* 214 (2017): 400-411.

Mycorrhizal relationships are largely mutualistic, but there are some instances where the mycorrhizal fungi can be parasitic. In some cases, the mycorrhizae take more than the plant it is connected to can spare, resulting in the plant's inability to function to full capacity, and potentially ending in the plant's death at the fungi's expense; this can be developmentally, environmentally, and potentially genotypically induced, as the surrounding environmental factors and the organisms themselves mediate the balance between positive and negative exchange[108].

The similarities between fungi and humans may be difficult to imagine at first. Fungi are, after all, classified as an entirely different kingdom of living beings than animals, and are considered separate from plants as well. However, at a baseline biological level, fungi have much in common with humanity. Fungi are considered to be more like, or more closely related, to animals than to plants[109]. Both are heterotrophs, meaning that they absorb or consume molecules that they need to survive; they must consume other heterotrophs or autotrophs (things that can produce the energy they need to survive on their own)[110]. In terms of consumptive dependencies, although humans are aware of consuming fungi in various forms, whether through the fruiting body that we recognize as mushrooms, baker's yeast, or brewer's yeast, fungi typically too small to see

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[108] N.C. Johnson, J-H. Graham, and F.A. Smith, "Functioning of mycorrhizal associations along the mutualism–parasitism continuum," *New Phytologist* 135:4 (1997), 575-85.
[109] S.L. Baldauf and J.D. Palmer, "Animals and fungi are each other's closest relatives: congruent evidence from multiple proteins," *PNAS* 90:24 (1993), 11558-62.
[110] "Heterotroph," Animals, Plants, Humans, and Ecosystems, JRank Articles, http://science.jrank.org/pages/3329/Heterotroph.html

also live on human bodies (living and dead) and consume human secretions[111]. Stable fungal populations may be integral to the health of a human body, in this regard[112]. Biologically speaking, fungi and humans are more alike than fungi and bacteria.

Humanity is also capable of beneficial mutualistic relationships. Social connections between humans allow for increased flourishing among the participants, as they share, borrow, give, or care for one another. Notably, humans also form these connections with nonhumans; it is not uncommon for humans to keep nonhuman animals as pets and to cultivate and care for plants of all kinds, both inside and outside of their own dwellings. These relationships can be positive for all involved. By sharing the resources that humanity possesses on individual and group levels, humans create a constructive network that not only helps themselves, but those with whom they connect.

Unfortunately, humans, like mushrooms, can also be parasitic. Although we tend to overlook this maladaptive practice, humanity has contributed to extraordinary destruction via parasitic relationships that inhibit or extinguish the capacity of other organisms to thrive. The cost-benefit analysis of these relationships heavily favors humanity. Animal husbandry, though it can be beneficial, has also contributed to the abuse, devaluation, and death of certain animals, particularly those like cows, chickens,

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[111] Ed Yong and Erika Engelhaupt, "Getting To Know Your Inner Mushroom," *National Geographic*, May 22, 2013, http://phenomena.nationalgeographic.com/2013/05/22/getting-to-know-your-inner-mushroom/

[112] Keisha Findley, Julia Oh, Joy Yang, Sean Conlan, Clayton Deming, Jennifer A. Meyer, Deborah Schoenfeld, Effie Nomicos, Morgan Park, Heidi H. Kong, and Julia A. Segree, "Topographic diversity of fungal and bacterial communities in human skin," *Nature* 498 (2013), 367-370.

sheep, goats, and fish used for meat, fiber, milk, or eggs. Environmental degradation has damaged entire ecosystems as pollution from oil, natural gas, chemical and other factories and extraction methods has infiltrated the air, water, and soil. Even within human-human relationships, parasitism is present. Political and social institutions may feed off the vulnerable, old, or weak. Individual humans may purposefully sabotage others in order to benefit themselves. Ultimately, though humans are capable of great compassion and care, they are also susceptible to committing the same self-serving actions that fungi may do (though whether either humans or fungi commit these actions intentionally is entirely circumstantial and up for debate).

Despite these similarities, acknowledging that humans are, in fact, special, is unavoidable. Humans are capable of a number of things that other animals are not capable of doing, and on a scale and with a speed that animals may not replicate. Within a newly imagined mycorrhizal system, humans and nonhumans of all kinds are active participants, but humans alone may also act as stewards. Humans must not only acknowledge their part in the interconnected system, but also oversee and manage the balance overall without preferential treatment for humanity. Nonhumans, whether they are plant, animal, bacteria, or fungi, are all equally worthy of the right to flourish as humans are, and the world must be overseen in a manner that is conducive to the collective flourishing of all members, all mycorrhizal citizens.

Suzanne Simard discusses the idea of 'hub trees' in her TEDSummit talk, noting that certain trees take on a more active role in transactions of nutrients[113]. These trees tend to be older and more established, and are capable of nurturing, in effect, those individuals it senses through the network of mycorrhizal connections that are in need of assistance[114]. Humans, as mycorrhizal citizens, must function like these hub trees, as stewards in a network where they actively seek to responsibly aid those in need while simultaneously maintaining one's own well-being. Our relationships are the tendrils of the myccorhizae, and we, the organisms, are the nodes delineating each piece of the ecological puzzle.

This stewardship operates as a mechanism to allow for the simultaneous success of as many organisms as possible. It seeks to preserve habitable environments and healthy individuals. It functions simultaneously in the past, present, and future, as it addresses past historical issues that now affect one's position in the present, the situation of individuals or groups at the present, and the securitization of a future where all have equal opportunities to flourish. Humans have a stake in maintaining healthy ecosystems, not just to ensure the proliferation of nonhuman life, but to ensure that present and future humans have a healthy and productive environment in which they may live and strive.

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[113] Suzanne Simard, "How Trees Talk to Each Other," *TED: Ideas Worth Spreading*, June 2016, www.ted.com/talks/suzanne_simard_how_trees_talk_to_each_other#t-3675
[114] Kevin J. Beiler, Daniel M. Durall, Suzanne W. Simard, Sheri A. Maxwell, and Annette M. Kretzer, "Architecture of the wood-wide web: *Rhizopogon* spp. genets link multiple Douglas-fir cohorts," *New Phytologist* 185 (2010): 543-553.

Mycorrhizal Polity

All forms of life and nonlife are sacred, interconnected, and necessary parts of a whole. Each part is integral to the survival of the others. Because of this, care should be taken not only of one's self, as an important part of the ecosystem, but also one's species, as a member of this group; nonhuman living organisms, those both food sources and not; and nonhuman nonliving entities, such as the earth, atmosphere, bodies of water, and other parts of one's environment. There should be no harm or destruction without reason: fulfilling one's basic needs, or protecting one's self, a member of one's species, a member or population of nonhuman species, or the environment upon which we all depend.

This requires a certain ethic of care and intentionality, which must not result in the assertion of human superiority and precedence over the survival and success of nonhuman organisms. Human stewards must not fall into the trap that caring has before among humanity: the assertion of a man taking care of his family (reinforcing patriarchal values), or a white human taking care of an nonwhite human considered incapable of caring for themselves (justification for slavery and ongoing racism)[115]. This can also be said of the detrimental relationships between humans and nonhumans that have resulted in animal abuse—these situations must be avoided. Unlike Hobbes' mushroom men, these individuals are not solely power-seeking[116]; they are balance-seeking. Because humanity possesses potential for great interspecies care, humanity must take a unique

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[115] Joan C. Tronto, *Moral Boundaries: A Political Argument for an Ethic of Care* (New York: Routledge, 1993), 115.
[116] Hobbes, *Leviathan*, 80.

position, despite their equality with other entities, as both part of the world and protector of it. This role requires humanity to make moral / ethical decisions for their own welfare as well as others. Although humanity may favor certain organisms and environments over others, preference must not be given in terms of ensuring individual and species survival as a whole. Preference may be given without hierarchy.

The mycorrhizal human citizen differs from binary constructions that previous theorists have created. Humans are neither inherently violent nor nonviolent. Much like other animals, humanity works to meet their basic needs: food, water, shelter, and safety. Much like some animals, once these needs are met, other needs and even wants may take precedence. Survival is the all-consuming motivator. Survival does not mean a lack or fear of death, but rather death's postponement until the body itself may no longer function. Individual or group survival may directly conflict with the survival of another individual or group, human or nonhuman; this is violent because it may bring the other's survival to an end or prevent its needs from being met, but if humanity is violent, then so are all living beings.

Humans are neither inherently competitive nor cooperative; they are both. An individual human can work together with another for survival. A mother or father can do so with their child. Kin may do so with kin. Nonrelatives can do so for another. A child can do so with an adult. These relationships are entirely unique based on the individuals involved, but humanity may work together in order to protect the group's survival; by cooperating, each individual may use individual strengths to compensate for another's weakness. Where one's weakness might have meant death on one's own, individuals can

be protected from even their own weaknesses by the cooperation of another human or humans. In some cases, humanity protects the survival of other humans at the risk or even loss of their own lives. Cooperation creates social dynamics that can increase longevity, but can potentially shorten individual longevity in favor of the group survivability. Altruism may not meet individual needs, but they may meet the needs of another human, with or without the expectation of reciprocity.

Conversely, meeting one's needs may conflict with the needs of another being met. Whether individually or in groups, humans compete for resources, which are not necessarily infinite and not always shareable. This competition does not come from a place of inborn aggression towards others, but rather recognition that when given the choice between the survival of one's self and the survival of another, humans may choose themselves or their own social group. In-group and out-group human relationships are common (although they do not promise violence). In-group membership does not guarantee in-group cooperation, and may, in fact, influence out-group cooperation with in-group competition. Humanity is competitive in that each human is still fighting for their own needs and wants to be met, and is not centered in a place of malice, but rather one of knowing understanding.

As Hobbes discusses[117], individual humans are equal as beings, but they may not be equal in strengths. Individuals may differ in cognitive, physical, and mental ability; some of these differences may be improved, and others may not. Despite how these components may positively or negatively affect an individual's survival, limitations do

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[117] Hobbes, *Leviathan*, 98-102.

not equal inferiority, only difference, unlike Hobbes' original account. Because humans possess the ability to compensate for apparent weaknesses as well as the ability to cooperate with kin or nonrelatives, difference does not mean death or automatic suffering. Difference may mean increased rates of survival for an individual or group. Ultimately, the interactions each individual has shapes their outcome, even as the faculties they were born with influences them.

Humanity has the capacity to create or destroy in nature, or their environmental surroundings. In this example, nature represents the nonliving or abiotic components of the world. This may include temperature, weather, sunlight, wind, rock, water, nutrients, atmospheric gases, edaphic, and physiographic factors, among others. These things may act upon humanity, and humanity may, in some capacity, act upon them. Although humanity does not always possess the ability to influence these factors, humans have been able to create from their environment ways of protecting themselves from problematic abiotic influences. In some contexts, this may mean destroying one to combat the other—such as the creation of shelter from rock or soil to protect from sunlight or temperature, or the creation of a garden to purposefully produce nutrients and protect from a lack of them.

Abiotic nature is necessary for human and nonhuman survival. It must coexist with biotic, or living, nature. Abiotic nature is not always helpful to survival, but it also does not always harm. Abiotic conditions may also help create ideal conditions for the easiest route to survival, and vice versa. As such, they must be respected, because they cannot be removed without distinct harm to the rest of the environment. Conscious

interactions with abiotic factors are integral to biotic survival, and cannot be ignored, and should not be influenced to the point of no return (i.e. the depletion of the ozone layer, the increase in greenhouse gases, the removal of nutrients from soil). Humanity has a distinct advantage in its capacity to change and endure abiotic conditions of many types, but must not fall victim to ego—abiotic factors must be monitored with care, and the accidental or deliberate alterations humans can enact upon these factors can be irrevocable and irreversible. Abiotic factors are, but humans (and nonhumans) do. Humans in particular must be conscious of their impact, as altering this nature may prove to be detrimental to their health and the health of nonhumans rather than beneficial.

War is a point of contention amongst political theorists, and an important point in the mycorrhizal polity. Humanity defines war by declarations, numbers of casualties, participants, sovereignty…at times war is extrapolated to animal conflicts: baboon or chimpanzee troops at war with one another, ants and termites with 'suicide missions', lions and some primates performing coups d'états, and parasitoid wasps' biochemical weapon, a virus, to control ladybird hosts into protecting wasp larvae that emerged from their own bodies[118]. It is thought that animals engage in 'limited war', or fights between individuals that do not intend to cause the death of the opponent, in order to both attain breeding rights, territory, and prestige while simultaneously maintaining their group

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[118] Ellen Jakubowski, "Animals that go to War," AnimalLogic, October 11, 2016, http://community.lovenature.com/wild/animals-that-go-to-war; Christie Wilcox, "Biological Warfare: Parasitic Wasp Uses A Virus To Control Its Host," *Discover Magazine*, February 10, 2015, http://blogs.discovermagazine.com/science-sushi/2015/02/10/biological-warfare-parasitic-wasp-uses-virus-control-host/#.WqGmjug-daq

population size / species survival[119]. 'Animal-plant war' can be used to describe the coevolution of some plants to produce phytoalexins to make themselves less palatable or digestible and the animals that eat them to produce new enzymes that break down these substances[120].

Because war is recognized to have many meanings, the use of 'war' loses meaning altogether aside from its usefulness to describe violent interactions. One can be at war for a variety of reasons, for motivations that may benefit oneself, the group, or the species, or a combination of these. One can be said to be at war when pursuing a food source—man pursuing deer, owl pursuing mice, wolf pursuing rabbit, horse pursuing grass, aphids pursuing leaf sap—these interspecies encounters may be considered war as one side seeks to attain the resources that the other possesses, effectively harming or killing the other in the process. When infected with a virus, an organism may be said to be at war when attempting to overcome it.

Seen in this context, war is a human-focused social construction, and its application is too broad and too anthropocentric to apply broadly to a mycorrhizal community. It is impossible, at the current moment in time and technology, for humans to discern the true motivations of animals and plants in inter-and-intraspecific contexts. We cannot see into the minds nonhumans. This does not mean that they do not have their own conceptualization that bears resemblance to our conceptualization of war—they very

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[119] J. Maynard Smith and G.R. Price, "The Logic of Animal Conflict," *Nature* 246, (1973).
[120] Frank J. Gonzalez and Daniel W. Nebert, "Evolution of the P450 gene superfamily: animal-plant 'warfare', molecular drive and human genetic differences in drug oxidation," *Trends in Genetics* 6 (1990), 182-186.

well might. This information is simply unattainable at present. However, the use of the term 'war' has been used to imply a certain magnitude of violence to dissimilar situations (for example, intraspecies mating conflicts and interspecies predation are both considered 'warfare') and is too ambiguous. Instead, conflicts for dominance may be used to describe nonhuman situations.

War may be used in human-centered and human-specific conflicts. The definition of war and whether war is natural is still contestable[121]. The extension of war to apply to human violence towards socially constructed concepts and practices is common, and human-specific. Because any given animal or plant cannot communicate its own self or socially constructed ideas, we cannot apply war to their interactions, even while we cannot assume that they do *not* wage war; we may say that they are involved in conflicts concerning dominance, as far as their goals may be understood. The understanding that we do not have a shared concept across all living beings for this idea means that war is limited to the human imagination; its application to nonhumans should be avoided whenever possible.

Property, a staple of many political theorists, must also be addressed. In a mycorrhizal community, property holds a different meaning. Whereas other political theorists have assumed that property is a natural right of humanity, property in the mycorrhizal community is not. Property here is territory, which must be defended and occupied. Borders extend only as far as the territory can be protected; if it is beyond the

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[121] Paul James and Jonathan Friedman, *Globalization and Violence, Vol 3: Globalizing War and Intervention* (London: Sage Publications, 2006).

capacity of the individual or group living upon it to defend it from others, then others may challenge for the right to that territory. This is not an assumption that humanity will inherently wage war or individual battle for territory; rather, it acknowledges that territory can be contested, and that borders are flexible, not concrete.

Territory that is plundered beyond repair, altered beyond sustainability, or poisoned is forfeit to those who occupy it. Not only must the territory be defendable, it must be cared for with proper stewardship. It is up to the human part of the community to discern how negligent, irresponsible, or greedy human behavior is addressed. Individuals who have territory but are incapable of caring for it, either temporarily or permanently, may decide who takes over their territory, or it may be left up to the community. Territory that has been abused must be cared for, and if it is possible to assist in its recovery, then assistance must be provided. Practices that pollute the land, for example, must be either eliminated or rectified.

Much like other animals, territory is shared across species. Because of this, a human territory may overlap with any number of nonhuman territories. This overlap must be respected; territory is not solely for human use and benefit. It benefits humanity to encourage and respect a diverse environment. Humans and nonhumans may be in competition for the same resources, and as such, humans may not take more than they need to deprive their competitors of their own needs. All members of any given space are to be respected in their commitment to survival, and humanity must not sabotage the territory for their sole benefit.

Although the mycorrhizal human citizen is individual, it is important to recognize that family groups serve an important role in the survival and well-being of humans. This family group may be comprised of kin and nonrelative human members in addition to nonhuman members. Although preference may be given to the survival of one's family members, this must not come at the detriment of others. Their survival may be of central focus, but while their needs are met, the needs of others should not be violated. There is room for exceptions: if, for example, an intruder entered one's home and threatened physical violence to one's family, one would be justified in meeting the intruder in physical violence, as long as one does not maim or kill the intruder without being certain of the intruder's intention to diminish the family or family member's basic need to live. By giving intention to kill, one may forfeit their own right to life; however, because their life is also sacred and of equal importance to the one they are threatening, to seek their death outright would violate norms.

Relatedly, children have at once an intimate familiarity and a distant recognition. They are their own individuals, despite their inherent ties to other humans. As the bearers of the continuance of human life, their education and care is integral to the survival of humanity, and by extension, the survival of the world[122]. Unlike their position in the present reality, children are not relegated to a marginalized and disenfranchised position

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[122] This should not be mistaken for a statement of the superiority of children over other members of the world. This is meant in the sense that children are the future of humanity, which holds a unique position as both within the environment as a member and outside the environment as a protector. 'Children' may also be conceptualized to refer to non-human young, which are equally deserving of agency.

of society[123]. Children do not reach maturity until the predetermined (genetic) age when their bodies and mental faculties are fully developed, although they may be culturally recognized as adults before then; this does not, however, mean that children should be considered ultimately incapable of meeting their basic needs and acting as protectors as well. Children should be treated with the same respect that an adult human would expect, and although adults may make decisions on behalf of their children, they should not deny children their own agency.

Combined, the individuals of a mycorrhizal community may be made up of one species; it may be made up of all species within a determined area; it may be made up of individuals who are connected via intrinsic or learned affinity, who may not inhabit the same geographic area. A community functions to connect individuals on a wider scale, much like families do. Just like a family, a community works together to meet the individual basic needs of its members. The mycorrhizal community is made up of members who provide various goods and services that allow the community as a whole to survive and flourish. Like an organism composed of many living and nonliving components all capable of contribution, a mycorrhizal community is intimately aware of the wellbeing and needs of its various parts. Effort is made to supply, assist, and / or care for any part that is unable to help itself.

A mycorrhizal community functions much like an organism itself; rather than this producing bounded and self-serving communities, the mycorrhizal community is invested

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[123] Neil Thompson, "Children, death, and ageism," *Children and Family Social Work* 2 (1997): 59-65.

in the welfare and survival of other communities. Though a mycorrhizal community may protect itself from parasitic infractions from other communities, they may also be involved in the healing of the community as a result of any harm they may have inflicted upon their aggressors in their defense. It should be noted that while the mycorrhizal community is intended to be understood as an amalgamation of humans, nonhumans, and environment, it could be specifically used to specify one or more species in particular in order to highlight the particular relationships each has. However, no individual members of the community serve as the 'center'; mycorrhizal communities represent the network, where no individual is more important or more powerful in the other in terms of equal representation as members of the community.

Figure 1. Hobbes' Leviathan reimagined representing a mycorrhizal community.[124]

Mycorrhizal communities may form even bigger mycorrhizal networks, where each community functions as a new node in the overarching system. In this manner, global connections can be made as the regional communities connect with one another to form an even bigger whole, which may then in turn be connected via relationships with communities that are not spatially near aside from their presence on the same planet. The same care should be taken in ensuring the well-being of each community; communities with increased capacity for resource relegation oversee actions that guarantee the most

[124] Aeris Bonds, *Untitled*, March 2018, Author's collection.

beneficial exchange. All communities are, once again, equal members meriting legitimacy and the ability to flourish. The mycorrhizal communities that are made from these networks are then one and many—the multiplicities that were an integral form of Deleuze and Guattari's rhizomatic work are present here, as well. With each node representing an individual, group, community in the network, encompassing varied distances, situations, and times, the mycorrhizal polity has no end and no beginning, no center, and no hierarchy. It is an interconnected web of time, space, and life.

Political institutions are a principal concern for humanity. The mycorrhizal community does not offer a specific solution in terms of civic governmental society. Government institutions must be fluid and flexible, capable of addressing the grievances of past wrongs in order to create true equality amongst its citizens. Although nonhumans are members of the mycorrhizal polity, and as such possess political motivations to secure their own safety and well-being, government institutions are human-centered (but not human-focused). The political aims of nonhumans, as best they are understood, must be taken into consideration and honored by the human participants in the governing system, as they may not fully represent themselves due to communication restraints.

The mycorrhizal polity rejects traditional forms of government. Institutions relying on the stratification of individuals, groups, or species based on worth are inconsistent with the mycorrhizal polity. The mycorrhizal polity is not against the utilization of present forms of government as a framework, but it must protect itself against the sway of anthro-and-androcentrism. Humanity must govern *with* nonhumans, and does not govern *for* them. The government that is formed is community-specific, and

as such, all institutions of government will contain differences in spite of similarities in tackling past issues. The mycorrhizal polity will have to allow for its government to be dynamic, and adjust their institution with each new day.

CHAPTER 5: CONCLUSION

This thesis is not invulnerable to criticisms found in related genres. Arguments published along similar lines have faced criticism for their either purposeful or inadvertent anthropomorphism, anthropocentrism, and androcentrism. There are those who find fault with the anthropomorphism attributed to non-humans in recent studies. Stephan Woodward, of the University of Aberdeen in Scotland, and Lincoln Taiz, of the University of California, Santa Cruz, do not believe that communication between individuals plants and communal species necessarily equates to sentience or intention; Taiz points out a historical precedent to a 'fatal susceptibility' to the mythology of "talking trees" that impart wisdom or treachery, which stands in contrast to his willingness to acknowledge "swarm intelligence" of trees, with natural selection as the guiding force[125]. Richard Fortey, a noteworthy British scientist[126], also expresses particular disgust with researchers who posit trees are sentient like people, as he also stresses that hormonal, involuntary and thoughtless responses are truly the nature of trees[127].

The arguments from Fortey, Taiz, Woodward, and others (this is not an inclusive list of critics) may well be valid, but their existence function in upholding historical epistemological understandings of the world. Instead of using hierarchical thinking to

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[125] Richard Grant and Diàna Markosian, "Do Trees Talk to Each Other?" *Smithsonian*, March 2018, https://www.smithsonianmag.com/science-nature/the-whispering-trees-180968084/

[126] Britain's notorious history of colonization and imperialism is wrought with similar arguments used to justify the subjugation and exploitation of indigenous peoples.

[127] Grant and Markosian, "Do Trees Talk to Each Other?"

provide a new framework of thought regarding the treatment of nonhuman entities, these criticisms operate within the 'logic of domination', the assumption that superiority justifies subordination[128]. In this case, sentience and intention are the presumed to be the superior qualities that humans possess, which justifies not only ignoring the potentiality for this assumption to be incorrect, but also the continued unsustainable destruction and exploitation of the natural world. Logic of domination has been used to justify natural resource use and depletion as well as the abuse, murder, rape, enslavement, and continued oppression of people of color, indigenous populations, and women. Human stewards in the mycorrhizal system are not superior members, and any such movement towards that ideology would be a violation of the underpinnings of the mycorrhizal polity.

Additionally, this kind of debate leads to a new set of questions rather than supplying any specific answer to previous existing questions: What is the problem with treating trees (and by extension, nonhumans) as though they were fellow sentient beings, deserving of the same rights and respect of humans, if it means a healthy forest? A healthy ecosystem? Whether or not one prescribes to the sentience and intentionality of forests, the language used by researchers like Peter Wohlleben allows science to reach an audience otherwise unmoved by emotionless and cold scientific fact recitation[129]. Although conceptual stretching can occur through this use of metaphor and emotion, the

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[128] Karen J. Warren. *Ecofeminist Philosophy: A Western Perspective on What it Is and Why it Matters* (Maryland: Rowman & Littlefield Publishers, Inc, 2000), 47.
[129] Peter Wohlleben, *The Hidden Life of Trees: What They Feel, How They Communicate; Discoveries from a Secret World* (Berkeley: Greystone Books, 2016).

end goal remains the same: considering the lives of trees (and other nonhumans) as worthy of the same dignity and care that we award humans without question. Forestry that concentrates on working with the natural processes of trees, regardless of the inner motivation, benefits humanity as well as the inhabitants of the particular environment. It seems, then, that the answer to this new set of questions might originate in the denial of moral and ethical wrongdoing and the inability to imagine the reality of the societal, governmental, and economic restructuring that would have to result from such a paradigm shift.

This paper serves to examine what the world might look like if a mycorrhizal model of living replaced or guided future circumstances. As it seeks to assert equality of all, it must address intersectional feminist history and issues, and as such effectively provides a safe space for the conceptualization of anti-patriarchal and anti-paternalistic constructions of society. It rejects the legitimacy of the specialization and separation of fields of study that have become associated with science and masculine-dominated society. In considering all living and nonliving things are worthy of enduring into the future, the mycorrhizal metaphor envisions a more just community.

Finally, it must be stated that this paper operates under the assumption that Thomas Hobbes' *Leviathan* is a thought experiment, and that the mycorrhizal polity is therefore one as well. It should not be taken as a construction of what the world 'naturally' should have been, and was deviated from, nor should it be considered the only solution to the world's ecological and societal disasters. It should be used as an abstraction meant to provoke thought of what it means to be the Other. This theory does

not assume that Hobbes is constructing a revisionist view of history, but it does acknowledge that Hobbes *and* the mycorrhizal polity proposed here are rooted in the times of their creation and the subsequent role of science and politics at play.

This theory may not be completely descriptively feasible in the present reality, but it presents thoughts worth entertaining concerning our present societal and environmental issues. Mycorrhizal structures and mycelium may be used as a model not only for the modeling of community, but also of self, in terms of creating a life structured on the basis of caring for all others as well as the environment that we all share. This might be used in order to combat environmental degradation and pollution that affects not only the land but also all organisms drawing resources from it. It might be used to provide care to people in less fortunate positions by either luck or institutional inequalities, and to stimulate interest in changing institutional systems that create problems that hurt, rather than help, its constituents. It might be used to point out those institutions that do not respect their constituents (or only some of them) or the environments in which they operate are doomed to failure eventually, and at the expense of those around them. Prescriptive solutions stemming from the idea of a mycorrhizal polity would vastly differ from policy prescriptions made under the assumption of human superiority and entitlement.

Mycorrhizae have found their way into other aspects of society that may help prevent environmental injury. There are efforts being made to produce ‘leather’ from mycelium and plant waste, which provides a waterproof, customizable, and durable

alternative to animal leather[130]. Mycelium is also being used to create a new type of building material grown using recycled materials from renovation projects, which is currently being tested for its construction strength and overall durability[131]. Still other companies are working to create packaging alternatives to Styrofoam and plastic, as well as packaging adhesive, from mycelium[132]. These alternatives allow for lower plastic consumption, the reuse of building materials, biodegradable packaging, and the prevention of animal deaths for use of their skin for leather, all contributing to a more eco-friendly market. Though far from being holistic solutions to environmental problems, these inventions represent the possibilities drawn from nature that could provide distinct changes in the way nature and the role of humanity are thought about.

Closing Thoughts

Hobbes may not have known that his mushroom metaphor was flawed, but without his work, this mycorrhizal thought experiment might not have existed. Fungi are not the first organisms that humans typically think to compare themselves to, despite the similarities. Primates typically take that role, as humans recognize them to be most closely related to them; however, this classification of species is a literal representation of

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[130] Selin Ashaboglu, "Object of the Moment: Mycelium Leather by MycoWorks," *The Journal of the American Institute of Architects*, published Aug 4, 2016, http://www.architectmagazine.com/technology/products/object-of-attention-mycelium-leather_o

[131] Hilary Crusin, ed., "Cleveland architect creates building materials from mycelium and debris", *Construction and Demolition Recycling*, published March 1, 2018, http://www.cdrecycler.com/article/cleveland-architect-creates-building-materials-from-mycelium-and-debris/

[132] Skanda Kadirgamar, "Company Uses Mushrooms to Grow Plastic Alternatives," *JStor Daily*, published Oct 17, 2017, https://daily.jstor.org/company-uses-mushrooms-grows-plastic-alternatives/

the arborescent critique posed by Deleuze and Guattari—it suggests a beginning and end, and a strict hierarchy. Comparing humans to primates has done little to persuade people that nonhumans and the environment are worthy of more respect and care. Perhaps by examining the world through a mycorrhizal lens, humanity can embrace the complexity and interconnection that is absent amongst tradition forms of thought. As the future of the world largely hinges upon the choices of humanity, it is imperative that humanity uses thought experiments like this one to constantly reevaluate and restructure its actions in order to fully merge the dynamic nature of existence with the desire of our world to persist in the future. If we enter into a social contract with the rest of the world as distinct parts of a whole that is our mycorrhizal polity, then as Hobbes has noted, the true injustice would be to break our contract[133] with not only all others, but also our selves.

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[133] Hobbes, *Leviathan*, 113.

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