Interconnected and Rhizomatic: Contemporary research in the field of plant studies challenges the perception that humans are exclusively intelligent

by

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Abstract

Question: (De/constructing the Human: Self, Identity and Other) Compare and contrast the work of two contemporary artists in relation to plant intelligence and the mycorrhizal network. Questioning the hierarchal position of the human.

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Interconnected and Rhizomatic delves into the exploration of plant intelligence through a post-humanist lens, challenging the perception that plants are an inanimate object that are a backdrops to human existence. Through engaging in the works of textile artist Lorraine Roy and multidisciplinary artist Sommer Roman, it draws an emphasis on the complex nature of plant communication through the mycorrhizal network. Roy works with researchers in the field of plant studies and tree communication to create an interplay between textiles and science, through considering theories such as the wood wide web, the Mother tree and kinship. Roman prompts the reconsideration of the human as the focal point to philosophy and interprets the interconnected relationship between plant, human and animal in her oeuvre, she challenges outdated views of the human hierarchy in philosophy. Both collectively investigate plant intelligence and cognition prompting an inquiry into our ubiquitous connection with nature, by examining the texts of key researchers in the field of plant studies. With an emphasis on interconnectedness, both artists weave in symbolism, theory and science in their practice creating a blurred line between science and art.

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Introduction

This essay seeks to assess the complex and intricate network of connections found within plants, shedding light onto plant intelligence through a post-humanist lens, by comparing and contrasting the role of two artists. It aims to shift the focus and decentre the human as the hierarchal subject in philosophy, by re-evaluating preconceived notions that regard plants as merely passive backdrops in our existence. I have chosen to interrogate this field by referring to textile artist Lorraine Roy, with a focus on her recent exhibition entitled *Woven Woods* (2017-2023) alongside multidisciplinary artist, Sommer Roman's exhibition *Noble Among Us* (2016). With reference to prominent theorists in the field, this essay explores how the artists use philosophy and plant studies to inform their practice, thereby establishing a connection between the realms of science and art. It further investigates how contemporary research in the realm of critical plant studies has brought to question plant cognition and consciousness, and illuminating the intricate ways that plants communicate through the mycorrhizal networks for multiple reasons. As defined by Sternberg (2012), intelligence is "the ability to learn from experience and to adapt, to shape and select environments", and that intelligence can be better understood in terms of the biology of the brain.

In Lorraine Roy's practice she draws upon her background in science and her research into tree studies and creates textile pieces using embroidery and raw edge machine appliqué with intricate patterns (Roy, 2021). Roy's *Woven Woods* was inspired by the symbiotic and

interdependent relationship between mycorrhizal fungi and tree roots as well as the recent ground breaking research into the existence of Mother trees and the Wood Wide Web. Inspired by her visit to the University of British Columbia where she met Suzanne Simard, one of the world's leading forest ecologist, she created an exhibition comprised of twelve pieces, each depicting twelve trees of various "types, seasons and stages of growth" and further communicates the diverse ways in which the mycorrhizal network functions (Roy, 2021).

The work of Sommer Roman endeavours to elicit a sense of awe regarding our environment and the symbiotic relationship among plants, animals and humans which is fundamental to our existence. In an interview with *Arte Morbida* 2022, Roman discusses how she approaches her practice and states that she is continually questioning "How do we know ourselves and understand the human experience in relation to the domestic worlds around us?". Roman's oeuvre further interrogates the concept of 'the Other'. Fascinated by the inherent connection between human and nonhumans, her sculptures are made exclusively from post-consumer, used garments and linen (Roman, 2013). Roman therefore aims to remove the hierarchy of the human and parody the head as the region for all logic and intelligence as posed by Descartes. The brain is perceived as the site for intelligence and cognition, as defined by Sternberg (2012), intelligence is "the ability to learn from experience and to adapt, to shape and select environments", and intelligence can be better understood in terms of the biology of the brain, Roman aims to deconstruct this preconceived notion.

It is noteworthy that both of the artists engage with the concept of the rhizome, both as a botanical term and within the realm of philosophy. In the field of botany and dendrology, rhizomes develop from axillary buds and grow horizontally, as described by Cheol Seong Jang et al (2006), rhizomes are “organs of fundamental importance to plant competitiveness and invasiveness”. Deleuze and Guattari expand upon the biological characterisation of the rhizome by injecting a philosophical stance, they assert that “the rhizome has no beginning or end; it is always in the middle, between things interbeing and intermezzo. The tree is filiation, but the rhizome is alliance, uniquely alliance” (Deleuze and Guattari , 2013, p.26). Roy and Roman both use threads and material in their practice, which implies a metaphor for the roots through the building of threads that knotted and woven to create a direct response to the thread like fibres found in the tangled roots and mycelium structures. Ingold (2015, p.48) uses ‘thread’ in his text as a double metaphor for roots and material thread. He explains that “where the ground itself is threaded with a tangle of roots, from which emergent trunks give rise to an equivalent tangle of branches and twigs in the canopy”.

The next section discusses the works of philosophers and theorists, drawing upon key texts from plant biologists and researchers to inform the research that has driven this essay.

Theory- Are We Superior?

Throughout the course of history, philosophy has held a prevailing belief that humans pose a superior status compared to all other creatures. The lack of research and understanding in plant studies, has resulted in a lack of understanding in plant agency, intelligence and symbiotic relationship with mycelium. This has had a repercussion on the way humans perceive plant life, with the inability to observe the intricate systems at play, it has placed the plant as the lesser.

In the era of post-humanism, an increasing number of individuals are advocating for the cultivation of care and respect towards plants, as well as the recognising them as autonomous and intricate life forms that deserve inclusion. Hall (2011a, p.10) builds upon this notion and concedes a vegetal turn in humanities and refers to plants as “new animals”, advocating the use of terminology such as “biospheric integrity” and “plant personhood”.

Division between human and nonhumans can be dated back to ancient Greek philosophers Plato and Socrates in the book Phaedrus written in 360 B.C.E. Socrates confesses to Plato, “I am a lover of learning, and trees and open country won’t teach me anything, whereas men in the town do” (Plato, 1972). Contrasting, Indigenous groups have shown to have a strong bond with plants from far back in history and is a big part of their culture, Hall (2011b, p.100) states that these groups such as Native North American and Māori people recognise the kinship between plants and humans on the basis of a shared heritage and coexistence.

Charles Darwin and his son, Francis Darwin were the first to scientifically document that roots show positive and negative phototropism, which led to the 'root-brain' hypothesis (Baluška et al., 2009). As noted in their book *The Power of Movement in Plants* they say that:

> "it is hardly an exaggeration to say that the tip of the radicle thus endowed, and having the power of directing movements of the adjoining parts, acts like a brain of one of the lower animals; the brain being seated within the anterior end of the body, receiving impressions from the sense-organs and directing the several movements". (1882, p. 518)

This observation applies two assertions. The first proposes that the apex may be a 'brain-like' possessing a sensitivity that traverses through the soil, and the second suggests that the root apex represents the anterior end of the plant body. Darwin suggests roots respond to light through movement, thus they react to the stimulus. Researchers in the field of plant studies have discovered that the roots of plants do not exist independently, rather, there is a rich and connected tapestry of fungi that interweaves through the roots that aids in communication and transference of nutrients.

In *Finding the Mother Tree,* Simard makes a comparison between the forest and the internet, linking back to the term that *Nature* journal coined in her 1977 article, 'wood wide web' but instead of computers linking to radio waves and wires, the trees were connected by mycorrhizal fungi (Simard, 2022a, p.257). Macfarlane (2020a, p. 85) states, the ultimate mutualism occurs between plants and mycorrhizal fungi and that this symbiosis is ancient,

an estimated 450 million years old. Macfarlane (2020a, p.85) posits that in the instance of "tree-fungi mutualism, the fungi siphon off the carbon that has been produced in the form of glucose by the trees during photosynthesis, by means of chlorophyll that the fungi do not have". Sheldrake (2021a, p.143) asserts that mycorrhizal fungi roots are "fifty times finer than the finest roots and can exceed the length of plant's roots by as much as a hundred times". Sheldrake (2021b, p.13) further refers to the Latin translation of the word mycorrhiza, 'mykes' means into being and 'rhiza' means roots.

Macfarlane references the term 'wood wide web' in relation to Simard's oeuvre, proposing that the network mechanism of the plant is able to communicate immune-signalling compounds to nearby trees. For instance, when aphids are under attack the network should up-regulate its defensive responses before the aphids reach it (Macfarlane, 2020a, p. 85). Wohlleben (2016, p. 8) discusses that another mode of communication is through chemicals such as pheromones and through electrical impulses, that enables trees to warn neighbouring trees of insect attacks, which is crucial for group survival. Recent experiments in this field have revealed an underground network that is living and thinking, through new technological advancements, researchers and scientists now have the capability to look deep within the soil layers and investigate their processes and systems. "The soil is fantastically impenetrable to experiments, and the fungal hyphae on the whole are too thin to see with the naked eye" (Macfarlane, 2020b, p.87).

Simard observed as she was raised in her family's business of logging, the adverse impact on the forest's ecosystem when the oldest trees were felled. Her later research identified that the Mother tree was a central hub that the saplings and seedlings nested around linked by a complex web of mycorrhiza. The survival of the 'Mother tree' is imperative for the successful growth of the younger trees in the forest as the elder tree provides nutrients to the saplings through the mycorrhizal network, she assimilates this relationship with a mother-child bond, nurturing and tending her young (Simard, 2022b, p.260). Drawing strong comparisons between the human brain and its neural networks and the interconnected mycorrhiza web found in trees, Simard implies "just as neurotransmitters pass signals across the synaptic cleft from one neuron to the other in our brains, signals might also diffuse across a synapse between interfacing fungal and plant membranes in a mycorrhiza" (2022c, p.261). Experiments were conducted to test theories about the mutual relationship between mycorrhiza fungi and roots using rare carbon isotopes as tracers to measure the flow and sharing of carbon, led to a staggering discovery that revealed that the trees were communicating and trading carbon produced by the trees during photosynthesis. Simard asserts that "Paper birch and Douglas fir were trading photosynthetic carbon back and forth through the network. Douglas fir received far more carbon from paper birch than it donated in return" (2022d, p.187). Birch trees received extra carbon from the fir when the birch wilts its leaves, and the birch trees supply carbon to the fir trees that are in the shade. Research revealed the relationship was reciprocal, thus mutually beneficial, where the trees were intricately linked and working in collaboration. This reveals that trees need to be observed holistically to fully understand their intelligent network, as they function as a whole as well as individually.

Gagliano (2018a, p.60) orchestrated a series of experiments with the plant *Mimosa pudica,* to test if the plant could learn, remember and make choices. Gagliano dropped fifty-six plants repeatedly from a heigh of 15 cm, each plant was dropped sixty times at five second intervals. The plant instinctively folded their leaves at the first few drops, as a response mechanism to danger, however, Gagliano suggested as the plant learnt that there was no direct threat, it no longer needed to fold its leaves (2018b, p.62). Later, Gagliano carried out tests to see if the Mimosa had remembered what had previously happened, "the plant retained the behavioural response they had acquired three days earlier was unchanged". (2018c, p. 63). This was a breakthrough in her research, the plants had remembered and retained the information, for humans learning from past experiences is contingent on the ability to recall memory, she goes onto say that memory is integral for successful learning to take place and that it is a key signifier of intelligence.

Lorraine Roy: *Woven Woods* (2017-2023)

Figure 1. 'Woven Woods' at Art Gallery of Burlington by Lorraine Roy (2018)

Lorraine Roy an esteemed textile artist from Canada, draws upon her formal education in science to create wall hangings and framed textiles using raw edge machine appliqué techniques and embroidery using a sewing machine (Roy, 2021). Through Roy's Bachelor of Science in Agriculture and Major in Ornamental Horticulture, she uses her ongoing studies of trees as a source of inspiration for her work. Roy explores how the symbiotic relationships between mycorrhizal fungi and tree roots creates channels for communication and resources between individual trees, she is further inspired by recent research carried out by biologists into the existence of Mother Trees and how they serves as hubs in forests as well as responding to theories such as the wood wide web and the Other. Continuing this line of research, Roy applied for an Ontario Arts Council Grant to travel to the University of

British Columbia and met Suzanne Simard. During Roy's time there she toured Simard's lab on campus and her facilities through the mountains of Kamloops.

As a visual response to the time spent with Simard, Roy created an exhibition entitled '*Woven Woods: A Journey through the Forest Floor'* (2017-2023) as seen in figure 1, which is comprised of twelve circular quilted wall hangings, measuring 26 to 45 inch in diameter, each depicting trees of different types, seasons and stages of growth and depict various aspects of the connection with the mycorrhizal network (Roy, 2017). Roy's choice to create twelve pieces, draws from the number 12 in numerology as the 'number completion' and is perceived as omnipresent, it is further suggested that it can be observed in mathematical systems and in several key astronomical concepts.

Roy's utilization of the circle can be linked through its presence in nature, it is a symbolic representation for the shape of the planet, a metaphor for infinity, it can be seen in the cross section of a tree and patterns observed in the roots of trees. Islam (2021, p. 93) discusses the metaphorical use of circles in paintings, "the simplicity and complexity disclose circle as a powerful symbol of infinity, continuity and eternity". Roy's also uses the circle motif as it "perfectly mirrors the inter-dependence of forest trees in their natural setting and reinforces a spiritual interpretation of this remarkable phenomenon" (2018). Roy opted for quilted wall hangings as an alternative to framed works, as the hangings are devoid of boundaries and framing of a rectangular format, which further conveys her organic expression. Furthermore, each quilted circle in the exhibition encloses a story about the thriving ecosystem and the intricate systems at play as seen in figure 2.

Figure 2. 'Ubuntu -Minerals' by Lorraine Roy (2016)

Figure 2, entitled *Minerals,* illustrates the molten core of the earth, and the top six inch layer of soil where fungi enables the transfer of minerals to roots. Organisms such as worms, bacteria and insects that inhabit the soil aid in breaking down particles and which is disseminate to the fungi and roots of plants. On the outer part of the piece, Roy depicts trees in bloom that go from yellow, red, blue and green which is indicative of changing

seasons, the trunks of the trees are rooted in the complex patterns that are connected to the earth's centre. The scale of the trees in relation to the underground network is imperative in conveying the deep rooted connection, rather than the top of trees being the focal point, the root system occupies the majority of the space on the quilted piece.

Notably, the African word 'Ubuntu' is a prefix given to each title, which translates to "I am, because you are". Further solidifing her message of the mutualism that occurs between plants and fungi, Marder (2013a, p.124) discusses the tending of plants towards each other in his book which can be observed through sharing of nutrients and growth. This creates the "non-conscious intentionality of vegetal life" which Marder terms as "sagacity" (2013b, p.117). Moreover, Marder goes onto say that plant-thinking is oriented to *the Other*, without establishing a hierarchy to deem an identity or self-identity, the non-individualism is a collective, a rhizome that acts together (2013c, p.125). This subverts and reimagines the notion of *I think*. Plants do not communicate in the traditional means that humans do, rather they act as a whole, this means that to observe the entirety plants, one needs to remove the preconceived notions of human intelligence to better understand these alternative communication methods.

Figure 3. ‘Ubuntu- Mother Tree’ by Lorraine Roy (2016)

Roy created figure 3, titled *Ubuntu- Mother Tree* as a visual response to the importance of older trees also known as Mother trees or Hub trees on a forest ecosystem (2016). Mother trees not only provide protection and nourishment to seedlings and saplings, but they also serve as a source of nutrients through a gradual release when they die. Roy argues that the preservation for deceased Mother trees is crucial, as they serves as habitats for a diverse range of forest animals and insects that reply on the hollows and soft areas of the trees for nesting, shelter and sustenance. Moreover, research has revealed that when seedlings start to germinate, it stimulates the activation of the mycelium which colonises its roots and connects it to the large mycorrhizal network. Consequently, this connection enables access

to a vast pool of nutrients, and connects to the roots of older trees that have access to light exposure that can subsequently benefit from their photosynthesis. As a part of Roy's ongoing research into trees, she visited a research site in British Columbia where she met Biologist Amanda Asay who was monitoring survival rates of related and unrelated seedlings of elder trees. Asay (2013) examined the effects of kin versus non-kin relationships and mycorrhizal networks, her research revealed that there was a "greater mycorrhizal colonisation compared to non-kin" as well as an increased total leaf area, volume and stem length is further indicative of kin selection. Her research further highlights that there was a reduction of competition due to close genetic relationship in kin trees opposed to non-kin. This suggests that there is a higher survival chance for trees that are seedlings of elder trees in the forest.

Roy's textile pieces are directly inspired and driven by research into the field of plant studies, blurring the line between art and science providing an insight into the mycorrhizal network and tree relationships. The next artist, Sommer Roman, further illuminates the field of contemporary art and philosophy by dismantling hierarchies of the human to investigate the recognition of plant mutuality.

Sommer Roman: *Noble Among Us* (2016)

Sommer Roman's solo exhibition titled *Noble Among us; material thought on poetic ecology* at HJ Miossi Gallery explores themes of intelligence and knowledge in non-humans as well as kinship and enlightenment. Roman creates curious and absurd hybrids of plants, animals and humans in an "interdependent, sensuous and playful orbit" through the process of deconstruction and construction, she dismantles hierarchies and "rampant consumerism" (Roman, 2013). Like Roy, Roman utilises the universal circular form as it is ubiquitously seen in nature, as well as textiles in her practice. The artist's work is characterised by its evocative use of colour and organic forms, which invites the viewers back to the realm of "interconnectedness, play, the wild feminine and the body as a potent site of wisdom and innate aliveness" (Roman, 2013).

In an interview with Maria Roseo for Arte Morbida (2022), Roman discusses that she uses the locus of the head as a riff to Descartes infamous quote "I think, therefore I am", as a way to question the rationale to seeing ourselves as above all non-humans by visually responding in "playful, biomorphic and tactile forms interwoven with elements of body, nature, home and beast" (Roseo, 2022). Building on Descartes quote, Roman parodied the mind-body theory, of the head as the powerhouse for logic and reasoning and apply it back to other realms. The exhibition is directly inspired by a term proposed by philosopher and biologist Andreas Weber called "Poetic Ecology", as discussed in his book *The Biology of Wonder*, Weber states "poetic ecology restores ecosystem human to its rightful place within nature without sacrificing the otherness and the nobility of other beings" (2016, p.3). The term 'Ecology' was coined by German zoologist, Ernst Haeckel in 1866 and it was used to

describe the study of the animals in relation to its organic as well as its inorganic environment, Haeckel applied the Greek words 'oekologie', meaning, 'home' or 'place to live' (Pimm and Smith, 2023). Ecology refers to the interactions between individuals and environments that form ecosystems, it has been defined as the study of interrelationships of organisms with their surroundings. Roman draws from these ideas posed by Weber and focuses on reciprocity, mutuality and interdependence (Cuesta College, 2022).

Figure 4. 'Four Nobles' in Noble Among Us exhibition by Sommer Roman (2020)

Roman created '*Four Nobles'* as the focal point to the exhibition, each sculpture entitled with a noble name; *the Empress, the Prince, the Queen* and *the Duke* (as seen in figure 4) . Noble titles act as a way to parody and collapse old orders where humans are superiors on

top of the chain, by employing these head like sculptures it aims to deconstruct and re-establish the hierarchical order in consideration of nonhuman beings. The exhibition aims to reinterpret the human-nature relationship, Roman comments:

> “This work aims to envoke a sense of wonder about life and our relationship to “other…” and furthermore, recalls the essential mutuality between plant, animal and human that is core to our aliveness" (Roseo, 2022).

Roman’s oeuvre is a response to the interconnected relationship between plants, animals and humans. Humans and plants have a complex relationship extending far back into joint evolutionary history. Schaal (2018, p.15) notes that the coevolutionary theory was determined by Peter Raven, a prominent figure in plant biology, Schaal further defines coevolution as the process by “which species interact with and respond evolutionary to each other- a definition that encompasses several relationships between plants and humans” (Schaal, 2018, p.15).

Figure 5. ‘The Queen’ in Noble Among Us exhibition by Sommer Roman (2020)

Figure 5, titled '*The Queen'*, centred in the middle of the exhibition and is comprised of textiles, branches and bulbous forms. Roman strategically placed the Queen at the top of the order, as she commands the show and shows dynamics of the pieces (Cuesta College, 2022). Roman uses the branches to hold the sculpture in place and keep it stable and delicately placed smaller bone pieces on top, which is integral in capturing these 'touch moments' which further eludes to the installation being intertwined although comprised of different elements (Cuesta College, 2022). The anthropomorphic floor sculptures uses Descartes analogy of the head, and pushes it into the realm of everything Other, constructing them into something wild and bodily, natural, feminine and everything other than being rationale.

Figure 6. 'We are Here to Self Reflect' in Noble Among Us exhibition by Sommer Roman (2020)

Figure 7. 'We are Here to Self Reflect' (side view) in Noble Among Us exhibition by Sommer Roman (2020)

Roman describes the piece *'We are Here to Self Reflect'* (as seen in figure 6 and 7), as humour pieces that address the head as a reconstituted form. At the centre of the sculptural piece, Roman places a mirror and positions the work at eyelevel as a way to confront the audience. The mirror acts as a device to implicate the viewer into the work and

to envoke introspection, thus the sculpture becomes less of an object and more of a collaborative act. Emanating from the central mirror and clay frame comes folds of richly stained used fabric, the alluring colours and gestural form invites the viewer to engage with the sculpture further. When creating the sculptures, Roman uses post-consumer textiles as a sustainable material, as a way to weave in an invisible memory and story which is linked to human experience and touch. It is important that the "materials have been already been part of someone's body, home, and life" and by incorporating them into her art gives the material a new lease of life and participates in a cyclical form of regeneration (Roseo, 2022).

Roman's conscious use of materials along with her philosophical perspectives underpin the significant message threaded through her practice of reciprocity, mutuality and interconnectedness in plants.

Conclusion

This essay investigated the role of two artists, Lorraine Roy and Sommer Roman, and specifically how they engage in the field of plant studies. Viewed through a post-humanist lens it has asserted that contemporary research in philosophy and biology has removed the stigma associated with plant intelligence. We have *never* been the *only* intelligent being. Research has demonstrated that plant intelligence is no longer something associated with myth or fantasy, but rather, grounded it in facts which is backed by scientists. There is a whole other world at play beneath our feet, that has its very much alive and has its own methods of communication, has its own feelings and responds to outside stimulus. We are

inextricably linked to the natural world, and this research proves that we are more alike than we once thought. And that we are not the only intelligent beings.

Investigating this has been invaluable in responding to the essay question 'Interconnected and Rhizomatic: Contemporary research in the field of plant studies challenges the perception that humans are exclusively intelligent'. Both artists engage with themes of interconnectedness with reference to the mycorrhizal network and fungi-root symbiosis. They delve into the intricate network of connections of plants, shedding light onto plant intelligence and how that changes the human-nature dynamic.

As noted, both artists engage with material practices as an accessible and sustainable medium, for Roman it is imperative that the textiles hold a memory of a person that once wore the item and regenerate it back into her artwork as a cyclical process. Regarding Roy's practice, she opted for circular quilted wall hangings as opposed to framed works as the hangings obscure boundaries imposed by a rectangular format, thus allows the organic rounded forms to exist untethered. Similarly, Roman utilises the circular form in her practice as it is ubiquitous in nature and used as a symbol of life.

Roman engages with philosophy and aims to abolish the power play between plants and humans. Contrasting, Roy's oeuvre is directly inspired by her formal education in Science, drawing inspiration from working with leaders in the field of plant studies blurring the line between art and science, making it accessible to understand through the creative medium of embroidery and fabric.

Throughout the essay, the research of Suzanne Simard, Robert Macfarlane and Michael Marder has informed the exploration into themes of plant intelligence, nonhuman agency and re-examining the relationship between plants and humans.

Plants are rhizomatic. Plants are intelligent. Plants are interconnected.

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