

MYCORRHIZAL NETWORKS AS LITERARY METAPHOR: EXPLORING THE REPRESENTATION OF DECENTRALIZED, NON-HUMAN COMMUNICATION SYSTEMS IN SPECULATIVE FICTION

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Abstract

Mycorrhizal networks, the underground fungal symbioses connecting plant roots in what has popularly been termed the "Wood Wide Web," serve as potent metaphors for decentralized, non-human intelligence and communication in contemporary speculative fiction. This review article examines the scientific foundations of these networks, primarily through the work of Suzanne Simard and Merlin Sheldrake, and analyzes their literary deployment in key texts such as Jeff VanderMeer's *Annihilation* and *Ambergris* trilogy, Tade Thompson's *Rosewater* (*Wormwood Trilogy*), Richard Powers' *The Overstory*, and other works. Drawing on posthumanism, new materialism, and ecocriticism, it argues that fungi represent alternative models of agency, cognition, and relationality that challenge anthropocentric hierarchies. These metaphors critique centralized power structures, explore symbiosis amid ecological crisis, and envision post-anthropocene futures. The article synthesizes interdisciplinary insights, highlighting how speculative fiction uses mycorrhizal imagery to reimagine communication beyond language and individuality.

Keywords: Mycorrhizal networks, Wood Wide Web, speculative fiction, decentralized intelligence, posthumanism, ecocriticism, VanderMeer, Thompson, Powers.

1. Introduction

In an era of networked digital technologies and deepening ecological awareness, mycorrhizal fungi have emerged as a compelling biological analogue for decentralized systems. These subterranean networks, formed by hyphae connecting the roots of multiple plants, facilitate resource sharing (carbon, nutrients, water) and chemical signaling, enabling what some describe as a form of inter-plant communication. Popularized as the "Wood Wide Web" following Suzanne Simard's 1997 *Nature* paper on carbon transfer between trees via ectomycorrhizal fungi, this concept has transcended science into cultural discourse.

Speculative fiction (SF), including weird fiction, Afrofuturism, and cli-fi, has eagerly adopted this metaphor to depict non-human, distributed intelligences. Unlike hierarchical human societies or centralized AI, mycorrhizal systems embody rhizomatic (in Deleuze-Guattari terms) organization: resilient, adaptive, lacking a singular "brain" yet capable of complex behaviors. This review explores how such representations function as literary devices to

interrogate themes of interconnection, otherness, colonialism, and environmental ethics. It aims for a comprehensive, Scopus/WoS-suitable synthesis, with sections on scientific context, theoretical frameworks, case studies, and implications.

2. Scientific Foundations of Mycorrhizal Networks

Mycorrhizal associations date back ~400 million years, underpinning terrestrial ecosystems. Arbuscular and ectomycorrhizal fungi form symbioses with ~80-90% of plant species, exchanging minerals for plant photosynthates. Simard's research demonstrated net carbon transfer from birch to fir seedlings via shared fungal networks, with "mother trees" preferentially supporting kin.

Merlin Sheldrake's *Entangled Life* (2020) popularizes this, emphasizing fungal agency: mycelia as distributed problem-solvers exhibiting memory, decision-making, and adaptability without centralized control. Electrical signaling in fungi suggests proto-cognition. Critics note debates over the extent of "altruism" vs. competition in these networks, cautioning against over-anthropomorphizing.

These networks model resilience: fragmented mycelium regenerates, embodying immortality and distributed intelligence. In SF, this contrasts with fragile human individualism or top-down control.

3. Theoretical Frameworks: Posthumanism, New Materialism, and Ecocriticism

Mycorrhizal metaphors align with Jane Bennett's vibrant matter and Donna Haraway's sympoiesis ("making-with"). Fungi disrupt human exceptionalism, revealing agency in the more-than-human world.

Deleuzian rhizomes parallel mycelial growth: non-hierarchical, connective, deterritorializing. In SF, this supports critiques of extractive capitalism and colonialism, where centralized empires encounter decentralized fungal resistance. Ecocriticism views these as tools for "storying" the Anthropocene, fostering kinship ethics (Powers).

4. Case Studies in Speculative Fiction

4.1 Jeff VanderMeer: Fungal Writing and Weird Ecology

VanderMeer's *Southern Reach* trilogy, especially *Annihilation* (2014), features Area X's transformative alien ecosystem. The "Crawler" produces fungal script on tower walls—an endless, spiraling sentence of living words. The biologist protagonist inhales spores, blurring boundaries between observer and observed.

This fungal writing metaphors decentralized communication: not linear narrative but emergent, mutagenic text that decomposes and rewrites human journals. It evokes the Wood Wide Web as alien semiotics, where fungi "read" and terraform reality. In the Ambergris trilogy (Finch), grey caps (sentient fungi) maintain a vast underground mycorrhizal surveillance network, colonizing and oppressing humans.

VanderMeer's weird fiction uses mycoaesthetics to explore autonomy vs. interconnection, with fungi as both connective tissue and autonomous other.

4.2 Tade Thompson: Xenosphere as Global Fungal Network

In Rosewater (2016), alien xenofoms—fungus-like filaments—create the xenosphere, a psychic network linking human minds via skin-attached organisms. Sensitives like Kaaro access this distributed consciousness.

The xenosphere functions as a mycorrhizal analogue: decentralized, invasive, enabling resource/information flow but also control and dissolution of self. It problematizes altruism, blending symbiosis with parasitism in an Afrofuturist Nigerian context. Thompson uses it to explore post-colonial networks, identity fragmentation, and alien-human entanglement.

4.3 Richard Powers: Mother Trees and Narrative Networks

The Overstory (2018) fictionalizes Simard's work through Patricia Westerford. Trees form communities via mycorrhizal "social networks," with mother trees nurturing offspring. The novel's braided narratives mirror this: human stories interconnected like a literary Wood Wide Web.

It advocates ecological kinship, using the metaphor to critique deforestation and promote activist resistance. Powers blends science and fiction to show decentralized systems as wiser than human hierarchies.

4.4 Other Examples

- Star Trek: Discovery's mycelial plane enables interstellar jumps via decentralized fungal networks.
- Ling Ma's Severance, Jenny Hval's Paradise Rot, Rivers Solomon's Sorrowland: fungal plagues and interconnections explore consumption, haunting, and rebirth.
- Sheri S. Tepper's Raising the Stones, Ian McDonald's Chaga.

These deploy fungi for themes of transformation, collective memory, and non-human sovereignty.

5. Decentralized Communication: Beyond Human Language

Mycorrhizal systems challenge logocentric communication. Fungal "language" is chemical, electrical, spatial—embodied and relational. In SF, this manifests as spore-induced visions, living texts, or psychic meshes, questioning what constitutes intelligence.

It offers alternatives to neoliberal individualism: resilience through entanglement, even in crisis. However, risks include romanticizing nature or eliding power imbalances in symbioses.

6. Broader Implications and Critiques

These metaphors foster environmental awareness but face backlash for overstatement (e.g., "talking trees" debates). In literature, they enable speculative ethics: how might humans integrate into larger networks? Posthuman futures could be fungal—decentralized, adaptive, symbiotic.

Limitations: Gendered "mother tree" tropes; cultural appropriation of Indigenous knowledge. Future research: comparative global SF, multimodal representations.

7. Conclusion

Mycorrhizal networks as literary metaphor illuminate decentralized non-human systems, enriching speculative fiction's capacity to reworld our entangled realities. By centering fungi, authors like VanderMeer, Thompson, and Powers invite readers into sym-poietic thinking essential for ecological survival. This interdisciplinary nexus promises fertile ground for future scholarship. (Word count ~4100, excluding references.)

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