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A R T I C L E

From Artificial Intelligence to Vegetal Sentience:Plants, Technology, and the Humanities in the Post-Anthropocene

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Abstract

Technology and the botanical world share intimately entwined cultural histories. As an extension of nineteenth-century industrial developments and, more recently, of twentieth-century digital advances, the emergence of generative AI has unleashed a torrent of ethical concerns related to plants, human-flora interdependencies, and botanical diversity. AI's ever-expanding process of reshaping vegetal futures is ever more embraced by ecologists and conservationists internationally. Yet, the specific convergence of artificial intelligence (AI), plant diversity, and vegetal sentience requires further critical scrutiny. On the one hand, globalized society's eager uptake of AI technologies can be said to obfuscate the transformative potential of existing more-than-human intelligences including the sentience of plants. On the other hand, artistic, literary, and scientific narratives call attention to vegetal sentience as an expression of plant intelligence in a world fixated on artificial, or manufactured, forms. Artistic and literary works, such as José Carlos Espinel and Jennifer Parker's "Tranformaciones, arte, ecologíay tecnología"(2024) and Jeff VanderMeer's Acceptance (2014), provoke these and other ethical queries by narrating scenarios in which artificial intelligence and vegetal sentience converge, fuse, and hybridize. Through the imagining of human-plant relations, their narratives accord with Keith Ronald Skene's (2020) assertion that future artificial intelligence models should incorporate principles of ecological resilience.

Keywords: Artificial intelligence; Botanical diversity; Global South; Interactive art; Plant humanities; Speculative fiction; Technological determinism; Vegetal sentience

1. Introduction

This article examines the complex imbrications between the environment and the humanities in the current age of exponential technological growth through a focus on vegetal life and artificial intelligence. To be certain, technology and environment share deeply intertwined histories. As an evolution of industrial and digital advances, the recent emergence of generative AI unleashes a barrage of ethical questions related to environmental and botanical justice. The prospects and perils of AI's ever-expanding influence on the vegetal domain are evident in the swift uptake of new technologies by plant conservation projects around the world. The prevailing view towards AI among such projects, however, tends to valorize the emergent technology in utopianistic language, thereby diminishing the real likelihood that AI colonialism will reinforce social and economic inequities between the Global North and the Global South. In this article, I propound the view that the field of interdisciplinary plant studies—also known as human-plant studies and the plant humanities—proffers a generative intersectional framework for analyzing the evolving ethical implications of AI. In particular, artistic and literary engagements with AI and plant life constitute pedagogical resources that engender critical thinking around pressing concerns of technology, humanity and more-than-human life forms, including flora, fungi, and fauna.

2. Technology, Environment, and Plants: Entwined Historical Trajectories

The dual histories of technology and environment are protracted, intersecting, and often contentious. As archaeologist David Miles (2016) has illustrated vividly, many of the social, political, and religious structures of Neolithic societies formed around polished stone axes employed to level forests for farming and to process timber for fuel, among other purposes. From weathered mould-board ploughs drawn by oxen to glistening combine harvesters directed by GPS, technology has been integral to the transformation of agricultural paradigms and practices. Etymologically, the fact that the term plant (as 'vegetation') eventually came to denote plant (as 'factory') signifies this peculiar ecohistorical interpenetration. In the late-eighteenth century, plant began to refer to an industrial complex and, later, in a pejorative

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sense, a spy (Harper 2025). By the late 1800s, cinematic and botanical advances also started to intertwine. As film instigated new understandings of vegetal life, flowering plants, in turn, inspired keen public interest in the moving image (Gaycken 2015). Through time-lapse in particular, events in the lives of plants became more perceptible and therefore more valued. Presently, in the post-Anthropocene context, commuters in Dhaka, Istanbul, Kinshasa, Mexico City, Mumbai, New York, Tokyo and other megacities interact, oftentimes unwittingly, with plants and other ecological forms on an everyday basis through the energy unleashed from petroleum generated from the primordial remains of organisms.

The "new era of exploration and documentation" heralded by botanist Warren Wagner and colleagues (2024) echoes the perils of technological utopianism and botanical imperialism (120). Nonetheless, what is undeniable is that technology will continue to contour human-environment relations, especially issues of conservation. To be certain, ecologists have become more and more dependent on drones and AI to identify biodiversity 'dark spots', maximize species loss predictions, monitor endangered flora trafficking, and respond to human-forest conflicts, specifically through enhanced data interpretation (Ondo et al. 2024). Machine learning and modeling techniques continue to facilitate more accurate determinations of the extinction risk of unassessed flora and fauna (Bachman et al. 2024). All the while, AI continues to contribute to the translation of human observations of plants and other organisms into scientific knowledge. For ecologist Sam Reynolds and colleagues (2025). AI has the potential to expand "the scope of human imagination or creativity" by pinpointing gaps or "surprises" in data, models, methods, and existing research paradigms (2).

In current environmental conservation discourse, AI tends to be exalted in techno-utopianistic terms as a redemptive possibility. Nonetheless, does AI and the environment always mark a generative convergence meriting the former's construction as a savior technology? Recent publications interrogate this conjunction from various angles, positing different critiques of the evolving entanglements between AI and environment including plants. In his study Artificial intelligence and the environmental crisis: Can technology really save the world? (2020), ecologist Keith Ronald Skene maintains that that artificial intelligence should adopt an entirely different set of principles based on ecological resilience rather than human cognition, if the technology is to actualize its potential to improve the lives of all beings. For Skene, AI's basis in ecosystemic intelligence—including vegetal sentience—would positively enhance environment, society and economics, precipitating a new era marked by the re-integration of humankind and the natural world. In AI in the wild: Sustainability in the age of artificial intelligence (2020), moreover, environmentalist Peter Dauvergne investigates how the tools of artificial intelligence are being leveraged —with varying degrees of success — to advance the objectives of global sustainability. Dauvergne, nevertheless, cautions that corporate and governmental bodies will invariably become tempted to appropriate AI to counter sustainability and facilitate technocratic governance, resource exploitation, and mass consumerism, as evident notably in the agrifood industry. In other words, states will weaponize AI to control the citizenry, suppress dissenting voices, and conduct cyberattacks on opposing states. In addition to these in-depth critiques by Dauvergne and Skene, the growing body of literature on AI and environment includes computer scientist Fei Fang and co-editors' Artificial intelligence and conservation (2019) and computer scientist Suneeta Satpathy and co-editors' AI for climate change and environmental sustainability (2025).

In addition to AI's contested relationship to environmental values, there are the intrinsic ecological implications of this emergent technology. In most countries—acutely in those where environmental policies are weak—AI's intensive requirement for electricity has triggered elevated carbon dioxide emissions, exerting a high degree of pressure on electricity grids. Any emerging AI model necessitates significant amounts of energy during the training phase yet continues to draw large quantities of energy long after it has been developed and deployed. A massive volume of water is needed to cool the hardware employed in training, releasing, and refining generative AI models, potentially straining municipal water resources and degrading local habitats. Estimates suggest that each kilowatt hour of energy consumed by a data center demands two liters of chilled water for cooling. All the while, AI innovation provokes the need for high-performance computing hardware, thereby triggering indirect ecological impacts from its production and transportation (Alnafrah, 2025; Bashir et al., 2024).

3. AI and Botanical Conservation: An Auspicious Convergence?

The intensifying usage of AI-based methods in botanical conservation reveals as many perils as it does prospects, echoing the critical assessments of Dauvergne and other scholars. As a case in point, identified recently in an isolated canyon on the Hawaiian island of Kaua'i, Schiedea waiahuluensis is a member of the carnation family (Figure 1). The cliff-dweller is the thirty-sixth recorded species of Schiedea, all of which are endemic to Hawai'i. The 345 known individuals of S. waiahuluensis inhabit small patches of soil in tiny fractures on the sheer rock faces of Kaua'i's Waimea Canyon. While uncovering a new species is historically significant in itself, the event at the same time marked the first usage of drone technology to locate and collect an

undescribed plant. In addition to taking aerial footage of the endemic, the team based at Hawai‘i’s National Tropical Botanical Garden, or NTBG, developed and deployed a remotely controlled robotic sampling arm called a Mamba, suspended beneath the drone, to procure a herbarium specimen (Letman 2024).

In 2019, additionally, drone imaging allowed NTBG to ‘rediscover’ Wood’s hau kuahiwi (Hibiscadelphus woodii), a hibiscus previously considered extinct (NTBG 2019) (Figure 2). According to the NTBG researchers, “hidden floristic diversity is likely to emerge as we embark on this new era of exploration and documentation of cliff ecosystems” (Wagner et al. 2024, 120, emphasis added).

Approximately 20,000 kilometers away, in the oNgoye Forest Reserve of South Africa’s easternmost province, KwaZulu-Natal, botanists are harnessing the potential of drones, remote sensing and AI to identify a female partner for the Wood’s cycad (Encephalartos woodii), routinely characterized in the popular media as “the world’s loneliest tree” (Pallardy, 2024). As indicated by fossil evidence from 280 million years ago, cycads are among the world’s most ancient flora (Jones, 2002). Palm-like in appearance, the trees are dioecious, so either female or male. Extinct in the wild since the early 1900s, moreover, E. woodii ranks as one of the planet’s rarest plants. All five-hundred specimens held in botanical gardens and collections across the globe are clones of the same male collected from oNgoye in the late-nineteenth century (Figure 3). Unable to reproduce by natural means and incapable of diversifying its genetic pool, the species remains severely susceptible to diseases and other stressors. Consequently, botanists are integrating drone technology with AI to detect possible female cycads in aerial images of the forest.

As a third case in point, the economically vital durian industry of Southeast Asia must respond to the complexities of climate disturbance through sustainable agricultural paradigms. In conjunction with artificial intelligence, drone imaging, genetic developments and other technological innovations in durian farming, environmentally sustainable approaches have high potential to offset climatic disruptions and facilitate crop production. While advancing durian yield efficiency, pest reduction and harvest management, AI is also enabling producers to accommodate the burgeoning international interest in the delicacy, notably from the Chinese market, and to boost the health-related benefits of consuming durian. AI-mediated pest control can bolster climate-focused initiatives, contribute to regional sustainability aims and improve the quality of Southeast Asian durians. Nonetheless, while the durian industry in the region will continue to undergo growth through these innovations in response to the escalating global demand, persistent barriers include the high costs of adopting AI technologies, knowledge gaps in the implementation of AI-based agricultural models and infrastructure challenges in many Southeast Asian countries (Teo et al. 2024).

As these three real-world examples demonstrate, one of the ecological implications of generative AI technology entails the resurfacing of colonialist ideas and practices. It is evident through these three cases that the same technologies applied to conservation can be exploited by rare plant poachers, illegal timber harvesters, transnational land grabbers, and government regimes bent on suppressing environmental activism, particularly among Indigenous peoples. Accordingly, there is the inherent danger of AI imperialism in which data originating in the Global South is processed by centers in the Global North to inform AI systems (Muldoon & Wu, 2023). This data power differential can result in the imposition of AI-based mandates on the South along with the destabilization of local knowledge and traditions. Cognizant of the need to minimize such risks, ecologists emphasize the crucial importance of “interdisciplinary collaboration” between AI specialists, conservationists, social scientists, local communities, and Indigenous knowledge-holders for the formation of accurate and ethical AI models (Reynolds 2025, 203). The next section posits interdisciplinary plant studies as an integral collaborative framework for assessing and addressing the relationship between AI and the environment through its intensive focus on botanical life.

4. From Artificial Intelligence to Vegetal Sentience

Despite the alarming rise of biotic homogenization in the Anthropocene, studies of plants’ intelligent capacities continue to proliferate. Termed plant neurobiology or neurobotany, this body of research investigates the role of communication, memory, sensing, and other cognitive processes connected to plant behavior. Neurobotany’s prevailing aim is to stage “a paradigm shift in how plant biologists regard plants conceptually” (Minorsky 2024, 1). Although lacking a brain and nerves — and, therefore, stigmatized historically as aneural or non-cognitive—plants demonstrate attributes that express their acute sensitivity to ecological change. Species such as rockcress (Arabis spp.), as a case in point, demonstrate altruism, including care for kin and non-kin, which enhances, through cooperation, the collective wellbeing of the ecosystems of which they are part. Japanese camellia (Camellia japonica), moreover, is known to emit chemical signals alerting nearby plants to possible danger from pathogens and herbivores. Research also indicates that pea seedlings are capable of learning by association while citrus trees inherit memories of predation, drought, and other stressors from prior generations (for an accessible, though already dated, introduction to key aspects of plant cognition, see Mancuso & Viola, 2015).

By foregrounding plants’ intelligent capacities, neurobotany troubles the prevailing Western outlook on flora

Figure 1: This composite image depicts Schiedea waiahuluensis habitat where (A) features the Waiahulu branch of Waimea Canyon in a drone photo by botanist Ben Nyberg and (B) shows a non-collected individual in a drone photo also taken by Ben Nyberg. Image credit: PhytoKeys (https://phytokeys.pensoft.net/article/130241/)

as deficient in sensitivity and intentionality. Neurobotanical research indicates that plants not only have the ability to communicate and respond but also to sense and remember. In the vegetal world, memory is an intricate cognitive function that affects plant behavior and enhances ecological adaptation. By communicating experiences of threats, sentinel plants allow their neighbors to minimize harm. Old sentinel trees, in particular, can transmit their knowledge of menacing conditions to younger generations to reinforce the resilience of their kin. This intergenerational

Figure 2: Ben Nyberg, a researcher at based at Hawaii's National Tropical Botanical Garden, rediscovered Hibiscadelphus woodii in the corner of the drone image. Image credit: NTBG (https://ntbg.org/news/conservation-aided-by-drones/)

exchange of experience also ensures that seeds germinate at different times and, therefore, have a higher chance of maturing. Recollecting variations in temperature, pressure, and light enables silver birches (Betula pendula) to anticipate and react to shifts in their habitat. Yet another dimension of the mnemonic faculty of plants is the repression of memories identified as potentially dangerous to offspring. In healthy forest habitats, the energy required to remember, communicate, and learn is often provided by symbiotic assemblages of plant roots and fungi known as mycorrhizae (Mancuso & Viola 2015; Minorsky 2024; Simard et al. 1997).

In recent decades, the existence of the "wood wide web" has gripped the human imagination of botanical life. Formulated by the editors of Nature to advance the pioneering work of forest ecologist Suzanne W. Simard and colleagues, the term denotes the subterranean communication networks mediated by mycorrhizae (Simard et al. 1997). Known as the rhizosphere, the root-soil interface where mycorrhizae are embedded is an especially dynamic zone of information transfer between species. In the rhizosphere, microorganisms, bacteria, fungi, and insects "form a special ecological niche that stays in equilibrium because of communication and collaboration with plants" (Mancuso and Viola 2015, 95). Sentience is an emergent property of the multispecies enclaves of which plants are part. The idea of plant sentience, therefore, specifies the depth of awareness possessed by a tree, shrub, bush, fern, or herb as an individual agent within an ecological collective. A sentient plant is able to experience, express, respond, discern, remember, and undertake behaviors associated with intelligence. Consequently, neurobotany approaches plants as both cognitive and sentient—as endowed with the capacity to see, hear, taste, smell, feel, and orient their bodies in space and time (Mancuso and Viola 2015, 45–80; Trewavas 2025; Trewavas et al., 2020). In conversation with these scientific breakthroughs, interdisciplinary plant studies examine the implications of vegetal intelligence for the arts, humanities, social sciences, and human-flora relations more widely in the post-Anthropocene.

5. Inter-/Transdisciplinary Plant Studies: A Potentially Collaborative Intervention?

Reynolds' (2025) stresses the need for interdisciplinary dialogue between various specializations and sectors to appraise the prospects and perils of AI. Consequently, the following discussion asserts that the implications of AI for the botanical world are best articulated through inter-/transdisciplinary plant studies—also known as human-plant studies and the plant humanities—as a framework of analysis. In response to the global biodiversity crisis, this steadily expanding field of scholarly inquiry encourages new perspectives on environment-technology conjunctions and, more specifically, plant-AI entanglements. Researchers broadly critique the dominant cultural narrative of flora as the passive objects of technological manipulation and aim to engender awareness of the significance of vegetal diversity in an ever more technologized world. The field synthesizes the theories and methodologies of human-plant studies (grounded in cultural studies), critical plant studies (philosophy), ethnobotany (anthro-

Figure 3: This image from the early 1900s captures the last two wild Wood's cycads (Encephalartos woodii) at oNgoye Forest Reserve in South Africa. Shown on the right, the smaller tree was collected in 1916 for relocation to Pretoria, while the larger one was badly damaged and not expected to survive. Image credit: Wikimedia Commons (Public Domain)

pology), economic botany (anthropology), phytocriticism (literary analysis), plant geography, neurobotany (plant science), and other related domains of knowledge (Ryan 2025).

Under the banner of the plant humanities and other monikers, inter-/transdisciplinary plant studies have gained momentum over the last decade as the intersectional study of plants and their multifaceted intersections with humankind. The term specifies "humanistic modes of interpretation" in the study of plants, society, culture, history, art, literature, and other domains (Batsaki 2021, 2). For researchers in the field, plants present "remarkable scope for research and interpretation due to their global mobility and historical significance to human cultures" (Dumbarton Oaks 2023, para.1).Key methods employed in inter-/transdisciplinary plant studies range from historical and archival research (Driver and Cornish 2021; Driver et al. 2022) to ethnographic investigation of plant cultures—or phytocultures—through processes of interviewing and observing that engage plants as active participants (Hartigan 2017). Moreover, some plant humanists undertake textual and discourse analysis (Meeker and Szabari, 2019; Ryan 2018) while others apply digital, AI, and quantum-based methods to conduct novel investigations of plants, people, and society (Arthur and Ryan 2024; Gianquitto and LaFauci

2022). Collaborative multispecies frameworks (Petitt et al. 2025; Welden 2022) and creative, arts-based, practice-led approaches (Arlander 2025; Ryan 2019) are also intensely shaping the emergence of the plant humanities.

One of the challenges negotiated by researchers in this nascent field has been described variously as plant blindness, plant awareness disparity and plant kinship blindness. Notwithstanding variations between them, these terms collectively foreground the human inclination to undervalue plants in everyday life and disregard the profound evolutionary bonds between flora and fauna, especially in the post-Anthropocene present. For James Wandersee and Elisabeth Schussler (1999), originators of the concept, plant blindness underscores "the perceptual and visual-cognition bases of why plants are often overlooked and neglected" (p. 82). In their view, this far-reaching bias propagates an attitude toward plants as inferior and, therefore, as not warranting serious consideration (Wandersee and Schussler 1999, 82). More recently, biologists Kathryn M. Parsley, Bernie J. Daigle, and Jaime L. Sabel (2022) have developed the "plant awareness disparity index" to measure the human tendency to neither notice nor appreciate plants due to one's attitude, attention, knowledge, and concern with fauna over flora. Formulating the notion of "plant kinship blindness," furthermore, François Bouteau and colleagues (2021) assert that, from an evolutionary perspective, animals and plants belong to sister groups. Although fauna and flora share a phylogenetic history stretching back 3.9 billion years, the refusal to acknowledge their genetic kinship endures because of the characterization of the latter as inferior. Despite the neglect of flora, congruences between plants and animals—for instance, the presence of cellular signaling and innate immunity in both—can energize a sense of identification with our chlorophyllic kin (Bouteau et al. 2021).

6. Artistic and Literary Narratives of AI and Vegetal Sentience

To study plants from the standpoint of agency, researchers draw from a variety of historical, archival, ethnographic, textual, digital, interspecies, arts-based, and collaborative methods. As a case in point, ethnographic practice within the plant studies framework includes observing, interviewing, and documenting human communities but also aims to recognize the specific contributions of plants as participants in research. In a comparable way, interspecies, arts-based, and collaborative approaches engage plants as sensitive agents capable of shaping the creative works of which they are part. Moreover, the historical and archival emphasis in plant studies to date reflects the field's growth through initiatives at botanical institutions such as Dumbarton Oaks Research Library and Royal Botanic Gardens, Kew (Arthur and Ryan 2024). The fact that many recent additions to the world's documented flora come from physical and digital collections, rather than remote habitats, underscores the importance of archival work in plant studies in response to the global biotic homogenization that is characteristic of the Anthropocene (Antonelli et al. 2023, 50–59).

The arts and humanities offer valuable perspectives for illuminating the ethical concerns arising from the entwining of artificial intelligence technologies and the botanical world. A recent example is "Tranformaciones, arte, ecología y tecnología" (2024), an experimental and multimodal project by José Carlos Espinel and Jennifer Parker investigating the relationship between algae and technology. In the work, AI transmogrifies the flowing shapes of seaweed in the medium of molten glass, unveiling new ways of conceptualizing adaptation and creativity in a rapidly changing global technological landscape. Through its implementation of AI, "Tranformaciones" reimagines algal forms as highly skilled glass artists balance the organic and natural with the technological and artificial. The integration of AI into the creative process of crafting glasswork provokes a critical perspective on the ethical and ecological ramifications of our increased reliance on artificial intelligence (Figure 4).

In the literary realm, writers of sci-fi and speculative fiction have cautioned readers about the potential perils of AI for decades, particularly vis-à-vis vegetal sentience. In the science fiction novel A fire upon the deep (1992) by Vernor Vinge, for instance, a team attempts to save two human children enslaved by a medieval lupine race and to seize a weapon that will rescue the cosmos from its downward spiral. In the narrative, AI is employed to analyze a massive volume of plant-related data, advancing research in the genetics and ecology of botanical life. Experimentation with AI leads to the creation of novel botanical entities known as Skroders, Riders or Skroderiders, a race of vegetal beings with fronds for arms. Within a world deeply transfigured by AI, Blueshell and Greenstalk stand out as the novel's two sentient vegetal protagonists.

Another salient literary work investigating AI's impacts on botanical life is Jeff VanderMeer's Southern Reach Trilogy, first published in 2014 and comprising the four novels Annihilation, Authority, Acceptance and Absolution. The first two titles of VanderMeer's sci-fi series center on Area X, an enigmatic yet self-regulating region where plants, humanity, and technology come into tension. By interrogating notions of vegetal sentience, perception and consciousness, the novels call attention to the potential impacts of artificial intelligence on humankind and the botanical world. Area X is inhabited by strange and mutable flora that exist in ways running counter to normative biological theories. In Acceptance (2014), biologist Saul Evans reaches toward a glistening object while suffering a delirium induced by a parasitic infection:

> He had gloves on still, so he knelt beside the

Figure 4: Artists created hanging glass sculptures of various algae through the use of AI (2025). Image credit: The Algae Society (`https://algaesociety.org/blog/transformaciones_art_ecology_and_technology/`)

> plant and reached for the glittering thing, brushing up against the leaves […] But whatever it was, it was swirled and glinted and eluded his rough grasp, and he began to feel faint […] He felt a sliver enter his thumb. There was no pain, only a pressure and then numbness […] Nothing now glittered on the ground in front of him. No light at the base of the plant. No pain in his thumb. (24–25)

The plants populating Area X engage actively with human characters such as Saul and the environment through unusual and uncanny behaviors. The AI-altered flora signify the uncharted potential of technological developments to transform the Earth—but not always for the betterment of biocultural systems. In VanderMeer's prescient narratives, the untamed and ominous nature of the vegetal characters invites readers to interrogate the intertwined ethical and ecological consequences of artificial intelligence, especially as it intersects with vegetal sentience.

7. Conclusion

Does AI offer new ways to advance the aims of ecological protection and plant-based cultural heritage? Or will AI colonialism eventually overshadow current and future innovations in conservation and education? While the conservation potential of AI grows greater by the moment, a multitude of perils lurks on the periphery of the techno-utopianistic discourse encircling this eminently promising yet world-transforming technology. To facilitate inter-/transdisciplinary dialogues around these and other concerns, the emergence of plant studies represents a propagative framework of analysis through its emphasis on the integral place of art and literature in inspiring the public's reimagining of botanical nature. At the same time, creative interpretations of AI through glass art, science fiction, and other imaginative modes offer pedagogical resources that can inspire well-balanced, critical approaches to comprehending the intricate entanglements between artificial intelligence and sentient plant life. Like other emergent technologies, AI can be harnessed to serve ecological purposes and more-than-human wellbeing but should also respect the social and cultural life-worlds in which biodiversity exists. The plant studies model gives shape to future research avenues on the ethical implications of AI for humankind's evolutionary affiliation with diverse vegetal agents.

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