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Passive Flora? Reconsidering Nature’s Agency through Human-Plant Studies (HPS)

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Abstract: Plants have been—and, for reasons of human sustenance and creative inspiration, will continue to be—centrally important to societies globally. Yet, plants—including herbs, shrubs, and trees—are commonly characterized in Western thought as passive, sessile, and silent automatons lacking a brain, as accessories or backdrops to human affairs. Paradoxically, the qualities considered absent in plants are those employed by biologists to argue for intelligence in animals. Yet an emerging body of research in the sciences and humanities challenges animal-centred biases in determining consciousness, intelligence, volition, and complex communication capacities amongst living beings. In light of recent theoretical developments in our understandings of plants, this article proposes an interdisciplinary framework for researching flora: human-plant studies (HPS). Building upon the conceptual formations of the humanities, social sciences, and plant sciences as advanced by Val Plumwood, Deborah Bird Rose, Libby Robin, and most importantly Matthew Hall and Anthony Trewavas, as well as precedents in the emerging areas of human-animal studies (HAS), I will sketch the conceptual basis for the further consideration and exploration of this interdisciplinary framework.

Keywords: plants; society; environmental philosophy; human-animal studies

1. Introduction

What else than the living organism allows one to see and sense true time? For a plant, a form is equivalent to an age—form is linked to size. Time is inextricably and correlatively tied to its life. A year is a node, a layer, a body separated from its surroundings and annexed, added onto, raised, directed, appointed, placed, built upon.

—French poet and philosopher Paul Valéry [1]

As agents of healing, sources of food and fiber, objects of ornamentation, symbols of inspiration and images of beauty, plants have been integrally connected for ages to human societies worldwide [2]. As the ethnobotanists Michael Balick and Paul Cox assert in *Plants, People, and Culture: The Science of Ethnobotany*, “the very course of human culture has been deeply influenced by plants, particularly plants that have been used by indigenous peoples around the world” [3]. Economic, aesthetic, and medicinal values are only a few of many associated with plants, both in indigenous and non-indigenous societies. Cultivated plants, in particular, have had multiple aesthetic purposes throughout history. In seventeenth-century Holland, for example, the fervid love of flowers galvanized the social and economic furore over tulips known as “tulipmania” [4]. In Australia, according to herbalist and botanical researcher Cheryll Williams, “few truly appreciate the immense contribution that our native plants have already made to our welfare—nor their extraordinary future potential and the need for their conservation” [5].

As the study of people, plants, and values, ethnobotany has been positioned traditionally in the social sciences as an interdiscipline linking botany and anthropology with an emphasis on indigenous uses of plants [6,7]. Economic botany focuses on the material role of plants across societies as foods, fibers, and objects of commerce. As defined by G.E. Wickens, economic botany is “the study of plants, fungi, algae and bacteria that directly or indirectly, positively or adversely affect man [sic], his livestock, and the maintenance of the environment. The effects may be domestic, commercial, environmental, or purely aesthetic; their use may belong to the past, the present or the future” [8]. In contrast, medical botany examines specifically the influence of plant medicines on human well-being [9]. However, in addition to ethno-, economic, and medical botany, there are recent noteworthy developments in the discipline of geography as “human-plant geographies” [10,11]; philosophy and theology as “philosophical botany” [12]; critical theory and literary studies as “critical plant studies” [13]; and cultural studies and transdisciplinarity as “cultural botany” [14].

By and large, utilitarianism is one of the dominant social values associated with plants: as food, fodder, fiber, and medicine; as substances or active ingredients; as the raw material of the natural world acted upon by the social world in a myriad of ways. Non-utilitarian social values associated with plants include aesthetic (e.g., the planting of kangaroo paws at botanical gardens or the use of herbs, such as parsley, as a soup garnish); symbolic (e.g., the use of trees and wheat in heraldry or the long-standing association between roses and love); linguistic and metaphorical (e.g., expressions such as “solid as an oak” and “flexible as a willow”); nationalistic (e.g., the wattle on the Coat of Arms of Australia, as shown in Figure 1); and cosmological and mythological (e.g., the Norse *Yggdrasil* or Tree of Life). For instance, plant creatures figure prominently in J.R.R. Tolkien’s Middle-earth fantasy writings, including *The Hobbit*, *The Lord of the Rings* and *The Silmarillion*. For example, in *The Lord of the Rings*, Frodo Baggins is put under a spell of sleep by the wise Old Man Willow. Other plants in the Tolkien legendarium are represented as embodiments of humans, often with magical or healing capabilities [15].

However, in contemporary thought, the view of plants as active and intentional beings is mostly limited to fantasy, mythological, and childrens’ literature. Admittedly, such myth-based associations between plants and human life, prosperity, and death do not provide an adequate basis for establishing plant intelligences, although these kinds of myths do affirm the cultural relevance of plants across diverse societies. However, human-plant geographies, critical plant studies, philosophical botany, and

cultural botany, as four significant developments in the way in which plants are regarded and researched socially and culturally, offer a way forward for contemporary perceptions of plants. These four approaches to plants differ markedly from ethno-, economic, and medical botany in their renewed conceptualization of plants as autonomous, agentic beings, rather than as mute materials or mere messages. In *Environmental Culture*, the Australian environmental philosopher Val Plumwood proposes a new model for thinking about and studying the non-human world, one which would regard nature as an *agent in*—rather than an *object for*—the production of knowledge and socioecological practices. The paradigm envisioned by Plumwood points to an ethics of dialogue between a researcher and an autonomous subject of research. Plumwood’s approach would necessitate “sensitive listening and attentive observation [and] an open stance that has not already closed itself off by stereotyping the other that is studied in reductionist terms as mindless and voiceless” ([16], p. 56).

Figure 1. The Coat of Arms of Australia is the recognized symbol of the country. Initially granted to Australia by King Edward VII in 1908, this version was granted in 1912 by King George V. The Coat consists of major floral and faunal symbols of Australian nationhood, including the Golden Wattle (*Acacia pycnantha*) on which the kangaroo and emu are posed. This is one example of the symbolic use of plants to represent national identity. (Image source: WikiMedia Commons)



As Plumwood’s argument goes, a dialogical model of knowledge-making is a response to the subject-object hierarchies—promulgated by conventional science-based research including ethno-, economic and medical botany—between a disengaged knower and a passive known (or a yet-to-be-known). Identifying this subject-subject knowledge paradigm as “an uncompleted task for modernist science,” Plumwood posits an urgent ecological and intellectual need to “recast the nature-devaluing aspect of rationalism” ([16], p. 55). According to Plumwood, an ethical science—evolving from a reconceptualization of the subject of research—would at the same time help to redress the hyper-separation between the humanities and the sciences, thus bringing forward an “ecological humanities” ([16], pp. 50–56; [17–21]).

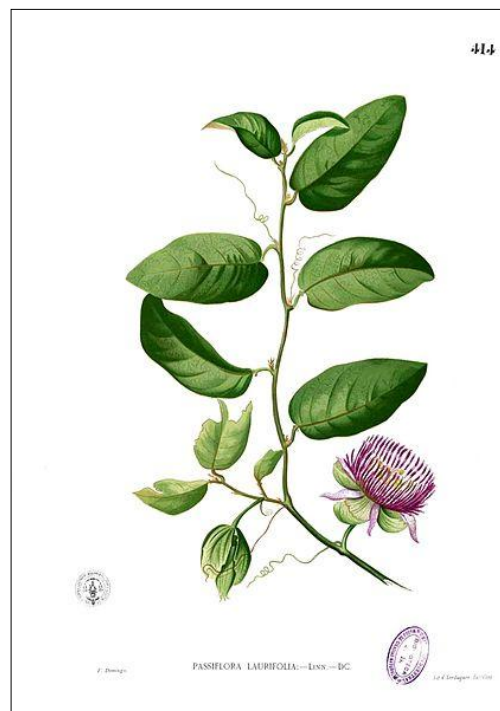
Plumwood's call is perhaps nowhere more relevant than to the study of plants—organisms conventionally regarded as automatons; as voiceless objects worked over by animate agents such as animals; as mindless constituents of the biosphere or landscape; and as mere material for physical and aesthetic consumption [11,12,22–24]. As Matthew Hall argues trenchantly in *Plants as Persons: A Philosophical Botany* (2011), plants are regarded ordinarily in scientific and social scientific discourses as passive, and are assumed to lack intelligence, consciousness, and behavior—those qualities defining animality [12,25–27]. As living beings, plants continually transact with their socioecological milieus, as the histories of agriculture, horticulture, silviculture, and biological invasions attest. Indeed, plants constitute certain social practices and customs as well as the ethics surrounding them. However, the agency of plants and their particular intelligences have yet to figure fully into the study of social practices and knowledge production. As suggested above, ethnobotany and its affiliates are dominated by a view of plants as food, fodder, fibers, and medicines. Of course, societies *act upon* plants: as weeds to expunge, as forests to harvest, as crops to trade, as seeds to plant, as ornamentals to accompany, as backdrops to ongoing social dramas. Houle asserts that the “backgrounding of herbality—indeed of ecology—is directly linked to the foregrounding of animality. It is a gestalt operation” [28]. While plants are more active and autopoietic than they have been depicted as in literature, art, and science, there are obvious fundamental differences between plants and animals—especially in terms of mobility, psychology, and emotions—that ought to be recognized. However, as recent research in the plant sciences argues, the differences between plants and creatures normally regarded as sentient are neither as profound as previously thought nor as substantial as purported for maintaining the predominant attitude towards plants as disposable materials, ecological automatons, or static backdrops to human desires.

What if we were to consider how plants *act upon* us, contributing to the co-generation of our cultural practices, values, perceptions, relations, artifacts, and all else through their volitions in the *umwelt* of which all living beings are part? The outlandishness of the question belies a deeply engrained assumption that, of course, plants do not produce *anything* but are shrewdly used by intelligent beings to produce the things of culture. The apparent foolishness of the question reaffirms the socially and scientifically indoctrinated position—the anthropocentric and zoocentric assumption—that plants cannot bear agency because they do not have brains. In his popular account of the reciprocity between plants and people, *The Botany of Desire: A Plant's-Eye View of the World*, Michael Pollan comments on the language used to describe human-vegetal relationships: “Even our grammar makes the terms of this relationship perfectly clear: *I choose the plants, I pull the weeds, I harvest the crops*. We divide the world into subjects and objects, and here in the garden, as in nature generally, we humans are the subjects” ([29], p. xiv). I extend Pollan's argument that, rather than a condition of people *acting upon* plants, it is more productive to consider global phenomena, such as agriculture, horticulture, and silviculture, as co-generated by people and plants in a shared *umwelt* reflecting a non-individuated, non-zoocentric form of intelligence.

The observation that people assimilate plants to social practices and customs reflects only one side of the reciprocity that characterizes human-vegetal relationships; it entails only the single condition of humans *acting upon* plants, or in Pollan's words, “I choose the plants, I pull the weeds.” Human-plant studies (HPS) would consider the obverse condition as well, that of plants *acting upon* humans to co-generate our milieus of sustenance, the places in which our everyday lives run their courses. The

recognition of this dual aspect of the human-vegetal dynamic lays the groundwork for the more contentious discussion of intelligence(s). However, considered to lack intelligence and volition, plants have been construed as inactive objects—decorative, aesthetic, and utilitarian (see Figure 2). As some theorists argue, the narrow ascription of intelligence to animals can be attributed to “brain chauvinism,” the assumption that thinking, volition, and communication are the qualities of “brained” organisms ([30], pp. 6–11). As Hall and Hallé argue, this zoocentric bias predicates intelligence on animal definitions ([12]; [25], p. 29). Indeed, the study of flora, across the humanities, social sciences, and biological sciences, reflects the assumption that plants are *acted upon* constituents—rather than *acting* partners—in socioecological networks. As a consequence, the notion that plants could possess ethical standing—as an outcome of their autonomy as demonstrated by recent scientific insights—is “downright silly” according to a recent article in *Nature* [31].

Figure 2. *Passiflora laurifolia* by Francisco Manuel Blanco (1880–1883). A species in the family Passifloraceae, *Passiflora laurifolia* is also known as Jamaican honeysuckle. An invasive plant in many parts of the world, it is native to Central and South America. Although often visually captivating, botanical illustration tends to communicate to a viewer only one phase in the life cycle of a plant and often neglects to depict the complex biological and cultural environments of which the plant is part. Representations such as these tend to fix living beings in space and time, reinforcing the perception of plants as static objects or “passive flora”. (Image source: Wikimedia Commons)



The object-making discourses intrinsic to the humanities, social sciences, and biological sciences devalue the agencies of plants. In light of this, it is imperative to interrogate our social, cultural, and scientific assumptions about the botanical world. Despite their marginalized and passive position in Western worldviews, plants constitute “more than 99% of the earth’s biomass” ([32], p. 463). Plant physiologist Anthony Trewavas, a prominent proponent of floristic intelligence, observes the capacity

of plants for adaptive behavior; they “possess a fine ability to adjust and optimally exploit the local environment” [33]. Moreover, a recent body of writings characterizes plants as agentive, autonomous, and intelligent subjects and considers the wide-ranging implications of research into plant intelligence and consciousness, pioneered most notably by Charles Darwin in the 19th century [12,26,27,34–36].

The aim of this article is to collect these embryonic pieces of theory, science, and historical exegesis—scattered across the humanities, social sciences, and biological sciences—under the heading of human-plant studies (HPS), an interdisciplinary research framework which would regard plants as intelligent, conscious, and capable subjects, rather than mechanical accessories—as “passive flora.” Building upon the conceptual positions of environmental philosopher Val Plumwood, anthropologist Deborah Bird Rose, philosopher and botanist Matthew Hall, and plant scientists such as Anthony Trewavas, as well as the precedent of human-animal studies (HAS), the basis for the ongoing development of human-plant studies through various frameworks will be posited. The implication of this framework is the reconsideration of plants in all forms of research, including the role of plants in society and their representations in the humanities. I will address the following keystones of human-plant studies: (1) plants are intelligent and volitional organisms; (2) plants are integral to socioecological networks and practices; (3) plant intelligences are viable exemplars for societies, cultures, and communities; (4) the roles of plants in society are best articulated through interdisciplinary research that considers art, literature, philosophy, Indigenous knowledges, and science; (5) the HPS framework will complement existing paradigms of ethnobotany and its affiliates.

2. The Paradox of Active Animals and Passive Plants

Although biologically alive, plants have been conceptualized as unthinking assemblies which only react when acted upon. Indeed, many of the dominant cultural metaphors for passivity are botanical. For example, to plant one’s feet; the set down roots; and to be vegetative imply a limited capacity for movement and intelligence. A “vegetable” is someone trapped in a mindless state—verging on death—without the ability to reason or feel. Trewavas asks rhetorically, “Do plants exhibit intelligent behaviour? The use of the term ‘vegetable’ to describe unthinking or brain-dead human beings perhaps indicates the general attitude” ([24], p. 1).

In the same regard, geographers Russell Hitchings and Verity Jones note a paradox. Although represented as passive elements of the environment, plants are also the quintessence of dynamic nature, epitomizing the ancient notion *physis*: “Vegetation is something passive in contemporary understanding: to be in a vegetative state is to be without mind. Yet the root meaning of the word ‘vegetative’ is associated with activity and enlivened animation” ([11], p. 15). Indeed, the late 14th century word “vegetative” suggested “endowed with the power of growth,” but it has been associated pathologically with brain death only since 1893 [37].

The assumption that intelligence is an attribute of animals and that plants are “mindless and voiceless” ([16], p. 56; [38]) is not endemic to the social or biological sciences. In works of art, plants are often cast as passive objects of aesthetics; wildflowers in particular have widespread popularity—though limited agency and intelligence—in many forms of art and literature [39] (see Figures 1 and 2). D.H. Lawrence and Mollie Skinner’s depiction of the Western Australian red gum or marri (*Corymbia callophylla*) in *The Boy in the Bush* (1924) presents one example: “Red gum everywhere! Fringed

leaves dappling, the glowing new sun coming through, the large, feathery, honey-sweet blossoms flowering in clumps, the hard, rough-marked, red-bronze trunks rising like pillars of burnt copper” [40]. The passage depicts living trees in static terms of color and form to create aesthetic objects—“pillars of burnt copper”.

While recent scholarly work in literary criticism and animal studies has produced “zoocriticism” to research the linkages between animals, literature, and culture [41], an analogous humanities-based field has yet to emerge for plants. (And would it be called *phytocriticism*?) How are the humanities and social sciences to couple new scientific understandings of flora to the criticism and creation of art, literature, and social practices involving plants? How can the humanities and social sciences help to resolve a widespread societal perspective “that regards plants basically as automatons” ([24], p. 2).

As a tentative response to these questions, I offer some background. In critical theory, which has affected greatly the course of contemporary humanities and social sciences, the rhizome (of plants) has become a significant metaphor for lateral thinking that cross-cuts subject-object binarisms (see Figure 3). For Deleuze and Guattari, the rhizome encapsulates postmodern yearnings because it “has no beginning or end; it is always in the middle, between things, interbeing, intermezzo. The tree is filiation, but the rhizome is alliance, uniquely alliance” [42]. The rhizome counters the growth-focused “arborescent” tropes of modernity by “burrowing through substance, fragmenting into simultaneous sprouts, moving with a certain stealth, powerful in its dispersion” [43].

Figure 3. The Mangles Kangaroo Paw (*Anigozanthos manglesii*) is the floral emblem of Western Australia and has adapted to its environment through an vigorous rhizomal system that enables the plant to endure extreme climatic fluctuations including drought and fire. The interest in the rhizome, as a potent intellectual metaphor in critical theory and postmodernism, is well-suited to the Mangles Kangaroo Paw, an enduring expression of environmental beauty and resilience in Western Australia. (Image source: Author)



The rhizome signifies the broad, subtly perceptible time scales over which plants evolve and exist. Valéry intimates this with his statement “time is inextricably and correlatively tied to [a plant’s] life” ([1], p. 107). Carl Jung, as well, commented that “life has always seemed to me like a plant that lives on its rhizome. Its true life is invisible, hidden in the rhizome. The part that appears above ground only lasts a single summer...What we see is the blossom, which passes. The rhizome remains” [44]. In contrast to animals, plants exhibit liminal temporality—an interbeing, *intermezzo*—between immediately mobile mammality and relatively immobile geology. The difference of time scales, observes Trewavas, “frequently makes plants *seem unmoving* [italics added]” ([24], p. 1).

Research into plant communication and behavior—which counters the notion of “passive flora”—commenced in North America in the early 1980s ([28], p. 98). This scientific research increasingly characterizes plants as autonomous agentic beings. The notion of intelligent plant behavior, however, can be traced back to Charles Darwin. In *The Power of Movements in Plants* (1880), Darwin and his son Francis described the embryonic root or the plant radicle as a brain:

It is hardly an exaggeration to say that the tip...acts like the 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 [45].

Charles Darwin and his son noted that the root tips perceived environmental stimuli and responded in particular to touch, moisture, gravity, and light. Furthermore, the radicle could discriminate between stimuli by selecting a growth response that would most benefit the whole plant. Plant scientist Peter Barlow writes “the complete set of tips endows the plant with a collective brain, diffused over a large area, gathering, as the root system grows and develops, information important for plant nutrition and survival” [46]. Rather than mechanical tropic movement towards stimuli as in phototropism or geotropism, the radicle exhibits “root nutation,” which for Darwin described the volition of the radicle brain, signified by its discriminatory ability. The plant brain is located diffusely in its “circumnutating root,” a system which can identify self and non-self roots, further suggesting the idea of volition, intention, and self-directedness in plants ([46], p. 48).

Drawing from the observations of the Darwins, plant neurobiology has recently been established as a discipline within the plant sciences. The premise of plant neurobiology is that plants are intelligent organisms, endowed with the capacity to learn, to communicate, and to make key decisions regarding their survival in the face of particular environmental constraints. Research increasingly confirms that plants use a variety of volatile compounds to thwart insects and other predators, but also to communicate with other plants within an ecosystem [47]. In fact, the immobility of plants relative to animals has generated a battery of adaptive strategies deployed as deliberate survival choices. These strategies, moreover, include the capacity for remembering environmental stressors and factoring these memories into future decisions [48]. Trewavas defines plant intelligence as “adaptively variable growth and development during the lifetime of the individual” ([24], p. 1). He characterizes the particular intelligence of plants as “mindless mastery” to intimate that plant intelligence exists without a central brain or mind, but rather as a diffuse system of intelligence located loosely in the roots (and signified by the phenomenon of root nutation, as mentioned above) [27]. An extensive review of current research in plant intelligence is out of the scope of the present discussion, but can be found in key works such as *Communication in Plants: Neuronal Aspects of Plant Life* (editors Baluška,

Mancuso, and Volkmann). However, the argument that plant intelligence is located in the roots reflects a zoocentric gravitas amongst plant physiologists to seek a brain analogue in plants or, in other words, a single organ or physical repository of intelligence governing the volitions of the whole organism. The kind of botanical intelligence I advocate is, indeed, diffuse, but is not the property of certain plant tissue located in discrete anatomical regions and manifested through pheromonal mechanisms. Drawing from biosemiotics, I will look towards the *umwelt* of the plant in defining intelligent behavior in relation to the condition of reciprocity with people and environment. It is only through this form of intelligence that plants have adapted to their environmental constraints over remarkable expanses of space and time.

Only recently have social and cultural studies of plants considered the scientific advances of the last thirty years. Of significance is Matthew Hall's *Plants as Persons* (2011) [12]. After tracing the notion of plant "personhood," or the moral consideration of plants in social practices, in various traditions from Christianity to Neopaganism, Hall synthesizes scientific research in plant sensation, movement, signalling, communication, intelligence, and learning to build a well-grounded, interdisciplinary argument for the reconsideration of plants ([12], pp. 137–156). As Hall argues elsewhere, the implications of intelligence (here used to include the capacity for sensation, signalling, learning, and communication) are far-reaching; plants are "sensitive, active, self-governing organisms" ([22], p. 173), "intentional, intelligent agents which actively try to maintain and perpetuate their own existence" ([12], p. 156). Similarly, Trewavas pinpoints a turning point "sweeping away the detritus of passivity, replacing it with an exciting dynamic—the investigation of plant intelligence" [27]. The intelligence and self-directedness of plants could catalyze a comparable revolution in the way in which we study environment and society.

Moreover, the intelligence of plants manifests in their transactions with other organisms as part of self-governing socioecological systems, or what Hoffmeyer calls in the context of biosemiotics "this infinite swarm of swarming swarms" or the "inner semiosphere," relating individual bodies and physiologies to the collective intelligences produced by multiple individuals working in symphony over durations of time in expanses of space ([49], p. 125). Hoffmeyer defines the semiosphere as:

Like the atmosphere, the hydrosphere, and the biosphere. It penetrates to every corner of these outer spheres, incorporating all forms of communication: sounds, smells, movements, colors, shapes, electrical fields, thermal radiation, waves of all kinds, chemical signals, touching, and so on. In short, signs of life ([49], p. vii).

As part of the semiosphere, plants can be seen to demonstrate highly integrated forms of intelligent behavior without exhibiting brain physiology analogous to animals. Not only is the biological model of intelligence predicated on zoological rather than botanical definitions, it further assumes a strongly individuated organism with the capacity to exploit its environment and manipulate other species in the Darwinian sense of survival fitness. It is most optimal, then, to regard the particular intelligence of plants as a dual mode comprising individual expression—the volition, behavior, and adaptation of herbs, shrubs, and trees on the level of single organisms—coupled to the manifestation of these same traits collectively by communities and populations of plants in ecosystems. The consideration of this acutely expressed dual mode of plant intelligence can liberate human-plant studies (HPS) from the erroneous assumption that, in order to argue for intelligence in the botanical world, researchers only need to identify the "brain-like" or neuronal features of plant anatomy. Recent plant research shows

that, not only have neuronal molecules been identified in plants, but also that some of the same neurobiological processes in animal brains are present in plants.

In countering the notion of plants as passive and somewhat fixed objects of science and culture that lack brains, botanical research across disciplines could consider principles of process and their implications for human understandings of plants as non-passive, as agentic and active participants in socioecological systems. The plant morphologist Rolf Sattler identifies how stasis—stillness, inertia, synchronicity—figures into contemporary understandings of plants. He transfigures the binary between stasis and dynamism by characterizing plant structures themselves as processes in perpetual action rather than fixed material manifestations:

Structure tends to be considered static, whereas process is dynamic. If we mistake the map for the territory, we conclude that plants consist of structures within which processes occur. On closer inspection we learn, however, that what appears static is in fact also dynamic [50].

Extending Sattler's ideas here, one could say that plants inhabit the world dynamically and liminally at the margins between being and becoming; stasis and process; synchronicity and diachronicity; and visual representation and bodily experience. Sustained sensory awareness of flora in a place implies that the “map”—the static appearance of the greenness of plants in botanical imagery, for example—is not the “territory”—the place of bodily interaction, the social milieu where people transact with plants in multiple, commonplace ways. In contrast to an atomistic philosophy of nature as an aggregation of stable things, a process perspective elicits “temporality, historicity, change, and passage as fundamental facts” [51]. Rather than biochemical extracts or anatomized parts, plants can be defined by their connectivities to dynamic events and other mutable beings. As plants change before our senses, so too do our bodies and social practices in relation to the plants. Process as a guiding principle in botanical research taps into the capacity of plants for complex and dynamic behaviors independent of the zoocentric model of intelligence.

Positively for the view of plants as agentic and autopoietic, Hoffmeyer's interpretation of biosemiotics rests on the assertion that “living creatures are self-referential, they have a history, they react selectively to their surroundings, and they participate in the evolutionary incorporation of the present in the future” ([49], p. 51). Hoffmeyer argues for “a theory on organisms as subjects” and, in doing so, stresses the importance of Jakob von Uexküll's *umwelt* or lifeworld theory. The *umwelt* is where interpenetration between an organism and its environment happens as

The conquest of vital aspects of events and phenomena in the world around [the creature], inasmuch as these aspects are continually being turned—by way of the senses—into an integral part of the creature. The *umwelt* is the representation of the surrounding world within the creature ([49], p. 58).

Importantly, the *umwelt* “allows the creature to become a part of the semiotic network found in that particular ecosystem” ([49], p. 58), including the sounds, smells and sensations of the environment as these stimuli impact reciprocally upon individual organisms and intelligent systems. A population of living things inherently dwells in a “semiotic niche” ([49], p. 59). Significantly, biosemiotics, according to Hoffmeyer, permits interpretations of intelligence independent of zoocentric models. Biosemiotics:

Releases the genie of reason from the well-guarded bottle which we know as the human brain and accords it an immanent position in the natural history fairy tale. This move enables us to unite the two separate spheres: Cultural history runs parallel to natural history; at one time they were one and the same ([49], p. 95).

Notably, Hoffmeyer describes “swarm intelligence,” implying that “rather than the brain being pre-programmed to produce intelligence, intelligence seems to swarm out of it” ([49], p. 114). Insofar as the model can get past the location of intelligence in a brain, Hoffmeyer’s biosemiotics appears to offer a way through the predominant paradigm of animal intelligence that has proved the basis for judging, and subsequently dismissing, plant intelligence: “Only animals have nervous systems and brains; these have never been found in plants—and from the dawn of evolution their purpose has been to control bodily actions, behavior” ([49], p. 47). On the diffuse intelligence of plants, Marder comments:

Each plant in its singularity is a collective being, a loose and disorganized assemblage, and, hence, a community of plants that do not comprise a unified whole, do not constitute either an individual or an organism. In vegetal beings, life is de-centered—not, as some might think, concentrated in the vital ‘organ’, the root, but dispersed and disseminated throughout the body of plant communities. [52].

3. Human-Plant Studies (HPS): Addressing the Question of the Plant

Drawing from intellectual currents such as biosemiotics, which reconfigures the separation between nature and culture, human-plant studies (HPS) would become the site for the revolution—an interdisciplinary framework that would suffuse the arts, humanities, and social sciences with scientific awareness of plants as intelligent beings, as outlined in the previous section. In an issue of the journal *Antennae* titled “Why Look at Plants?” Giovanni Aloï asks provocatively:

Would there be productive opportunities in attempting to understand plants from different perspectives, just as the field of human-animal studies has proved possible with animals? What contributions to our understanding of animals could a focus on plants make? Could we even envisage that, in the near future, we may have a field of human-plant studies? [53]

A precedent for HPS exists in human-animal studies (HAS), focusing on animals and human-animal relations and differing to the anthropological subdisciplines ethnobiology and ethnozoology. Armstrong and Simmons identify “the cultural, philosophical, economic and social means by which humans and animals interact” as central to HAS research [54]. In similar terms, Shapiro and DeMello note the “question of the animal” that has been at the centre of HAS since its inception in the early 1990s: “Why do we think about animals in the ways that we do?” [55]. A corresponding question would guide human-plant studies: “Why do we think about plants in the ways that we do?”

Definitions of HAS emphasize its interdisciplinarity, akin to other “studies” with radical political origins—environmental, women’s, and cultural, for instance ([55], p. 6). HAS is “a rapidly growing interdisciplinary field that examines the complex and multidimensional relationships between humans and other animals. [It comprises] psychology, sociology, anthropology, political science, history, literary criticism and other disciplines in the humanities” [56]. HARN, the Human-Animal Research Network, characterizes HAS as critical of the history of “human” and “animal.” HAS addresses, for example, “why some animals have protective legislation and others do not; why some of us eat

particular animals but not others; why being ‘an animal’ is akin to denigration, and what cruelty to animals says ‘about us’” [57].

As a common subject of analysis, animals and the question of animality and society define HAS. The field addresses the “lack of scholarly attention given to nonhuman animals and to the relationships between human and nonhuman” ([55], p. 2). HAS investigates human relations to animals and the experiences of animals as autonomous creatures, not merely as “cultural artifacts, symbols, models, or commodities in a largely human-centred world” [58]. According to recent HAS theorists, in order to make progress as a scholarly field, HAS will need to identify “ways of understanding animals and human-animal relations that are not constrained by traditional disciplinary boundaries and methods” [59].

The strength of HAS is its receptivity to scientific perspectives—biology, zoology, and ethology in particular—without its possible constriction by empirical methods solely ([59], p. 3). Freeman and Leane advocate a transition within HAS from multidisciplinary—in which disciplines comeingle without significant integration of knowledges and methods—to interdisciplinarity where “scientists, social scientists, and scholars in the humanities collaborate intellectually” [60]. The steady growth of human-animal studies in universities and scholarly journals suggests the timeliness of these approaches to the question of the animal ([55], p. 3). An April 2012 article in *The Washington Post* concludes that HAS is in transition from a fringe activist movement to an increasingly established scholarly field [61].

Extending the HAS precedent, human-plant studies (HPS) would redress the lack of scholarly focus given to plant intelligences, as well as secular or sacred human-plant interactions. Comprising “more than 99% of the earth’s biomass” [32], plants are integral to culture, society, literature, and art—not only ecology and scientific awareness. As an example, in the biodiverse South-West of Western Australia, botanical imagery proliferates in visual culture—contemporary wildflower photography [62]; endemic symbols of statehood [63] (see Figure 2); and the works of botanical artists [64–66]. HPS would identify innovative ways of understanding plants and people-plant relations. It would do so through knowledge of empirical advances but without the limitations of disciplinary parameters, as HAS strives to do with increasing recognition and influence. HPS would engage an interdisciplinary dialogue with botany, conservation biology, forestry, agronomy, horticulture, sociology, cultural studies, medical herbalism, ethnobotany, and landscape architecture, for example.

In light of advances in scientific understandings, HPS would regard the autonomy of plants and their bearing in social practices—not merely their relevance as cultural symbols or aesthetic accessories. The further negotiation of the moral standing of plants would also be included within HPS [12,22,67,68]. What constitutes cruelty to herbs, shrubs, and trees? What does the unbridled overuse of flora for human physical and aesthetic consumption say “about us?” How should we reconsider plant and human interactions through the prism of recent advances in conceptualizing plants? Moreover, HPS would re-examine kinship and connectivity between plants and society, including the paradigm of plants as teachers [69]. In Fremantle, Western Australia in 1833, to offer a colonial example again from the biodiverse corner of Australia, the Austrian botanist Baron Charles von Hügel remarked in his journal “I could not wait to get out into Nature, into my *kindred* world of plants, which had so often held my gaze when bowed down by deep sorrow” [*italics added*] [70]. A feeling of kindredness, reflected here by von Hügel, implies that plants are much more than inert backdrops to human affairs, as Matthew Hall, Anthony Trewavas and other scholars in various fields have already argued in convincing detail.

4. The West Australian Christmas Tree through a Human-Plant Studies Lens

In order to glimpse how the HPS framework can be applied to actual plants, I offer a brief example comprising traditional Indigenous Australian Dreaming knowledges and contemporary scientific understandings. According to ethnobotanist Philip Clarke, “the ‘Dreaming’ is an Aboriginal English term used to embrace indigenous religious beliefs about the Creation and the laying down of Aboriginal Law” ([7], p. 23). Agency in the botanical world is perhaps best exemplified through the Aboriginal concept of Dreaming plants, which facilitate strong, long-standing ontological links between plants and people. Sacred plants are often recognized as ancestral beings themselves or as deeply implicated with the spiritual passage of human beings to the after world. As Clarke goes on to explain, “even when plants do not represent the actual Ancestors, they may be seen as having been involved with Dreaming activities in the Creation” ([7], pp. 23–24). Some plants have clear utilitarian roles as foods, fibers and medicines in Aboriginal societies (and have thus been used intelligently and sustainably by those societies). Others have *perceived* agency as Creation beings actively contributing to the generation of cultural beliefs, practices, and traditions; and/or *actual* agency in their resilient modes of adaptation to the socioecological landscapes of which they are part. Indeed, some plants are known as powerful, sacred, and vital plants to Aboriginal societies: agentic, autonomous, and volitional Creation beings, qualities of the botanical world that have only recently been corroborated by plant science. A prominent example is the West Australian Christmas Tree—known as *mudjar* in the Aboriginal Australian language Nyoongar and *Nuytsia floribunda* to scientists—is endemic to the South-West corner of Western Australia. The plant has numerous significant ecocultural meanings [71]. Modern botanical science classifies *Nuytsia* as a mistletoe endemic to the South-West region. As a root and rhizome hemi-parasite, the plant parasitizes a number of hosts but also has the ability to make its own food through photosynthesis [72]. The parasitizing rootlets coming off the main roots of the *Nuytsia* are so tenacious that they have been known to burrow into underground utility lines.

In the 1930s, the ethnographer Daisy Bates [73] noted the close associations between Nyoongar (or Bibbulmun) spirituality and the Christmas Tree:

The tree-Moojarr, or Moodurt...was to the Bibbulmun [Nyoongar] the ‘Kaanya Tree’ ‘the tree of the souls of the newly dead’. From time immemorial the soul of every Bibbulmun rested on the branches of this tree on leaving its mortal body for its heavenly home, *Kurannup*, the home of the Bibbulmun dead which lay beyond the western sea.

Nuytsia facilitated the passage of souls to the after world, but as Bates claimed, the tree was feared and avoided. Other early ethnographers recorded the use of *Nuytsia* as food, water, and decoration, suggesting that within the South-West, there have been variable spiritual beliefs and cultural practices surrounding the tree [74].

The colonial diarist and settler George Fletcher Moore described the Christmas Tree as “*Mut-yal*, s.-*Nuytsia floribunda*; colonially, cabbage-tree. The only loranthus or parasite that grows by itself. Another anomaly in this land of contradictions. It bears a splendid orange flower” [75]. As the world’s largest parasitic plant, the Christmas Tree epitomized the baffling growth habits of New World species in the eyes of European botanists. It represented the departure of the Australian landscape from Old World norms. Even the name “Christmas Tree,” flowering in yellow as it does in the heat of the late

spring and early summer months of November and December, runs contrary to the image of the evergreen Christmas tree brought indoors from the cold and deep snow of the English countryside.

Early European colonists to Western Australia reported mixed admiration and disdain for *Nuytsia*. The tree in flower was first recorded by the crew of Dutch explorer Pieter Nuyts's vessel *Gulden Zeepaard* in 1627 [74]. *Nuytsia* was assigned as its scientific name in 1831 by the botanist Robert Brown and the tree was referred to as "Fire Tree" [76] amongst the colonists. In the journals of Western Australian surveyors Alfred Hillman and Septimus Roe, *Nuytsia* indicated infertile country and was described disparagingly as part of the intolerable scrubbiness of the landscape [71]. In 1880, peripatetic artist Marianne North painted "Study of the West Australian Flame-tree or Fire-tree," now part of the botanical art collection at Kew Gardens in England. However, the tree depicted in the painting appears more like a European elm tree with its pleasant vase-like form than most Christmas Trees found in the Western Australian wild (see Figure 4).

Figure 4. Marianne North's "Study of the West Australian Flame-tree or Fire-tree" (1880). *Nuytsia floribunda*, or the West Australian Christmas Tree, is represented here as a European elm with a fluted canopy and fairly symmetrical overall form. Human-Plant Studies, as a framework for researching *Nuytsia* and other plants, would invoke interdisciplinary perspectives on the species in question, while also exploring the agency of plants in contributing to the formation and cohesion of human societies and cultural practices: Indigenous, colonial and post-colonial. (Image source: Reproduced with the kind permission of the Director and the Board of Trustees, Royal Botanic Gardens, Kew)



For some Aboriginal Australian people, the Christmas Tree is considered a sacred, Dreaming plant linked to the souls of the deceased. The writings of early settlers and ethnographers point to some of the spiritual beliefs and material practices surrounding *Nuytsia*. In the 1930s, Bates reported the view of *Nuytsia* as a home for disembodied spirits when she wrote that the Nyoongar people "did not fear

the tree; they loved it, but held it sacred for its spiritual memories. The souls of all their forbears had rested on the spirit tree on their way to Kurannup” ([73], p. 153). However, writing in the 1880s, diarist and settler Ethel Hassell reported the use of *Nuytsia* root as a candy:

They gave me one of the roots to taste, telling me it was called *mungah*. The outer skin was pale yellow but easily stripped off leaving a most brittle centre tasting very like sugar candy ([77], p. 26).

A ghoulish creature called a *gnolum*, in the form of a very tall, very thin man, enticed boys away by offering them the roots of the *mungah* tree ([77], p. 65). In traditional Nyoongar thought, the *mungah tree* is literally ensouled, bearing the spirits of the deceased and facilitating their passage to the next life. The tree is not simply the passive material or medium for the forging of cultural artifacts or practices. Indeed, the sacred tree is *acted upon* as a sugar candy eaten or as decoration worn for ceremonial purposes. However, in the tree’s capacity to liaise with the spiritual world, to invoke fear and respect, and to associate with other-worldly figures, it manifests some degree of agency synchronized to the active processes of its social, spiritual, and ecological milieu—its broader *umwelt*. Hence, human-plant studies reflects on Indigenous knowledges of plants in conjunction with scientific and Western cultural knowledges to identify points of commonality and *cross-pollination*.

5. Reconsidering the Role of Plants in Society through HPS

What intellectual niche would human-plant studies serve and what can recent developments in the humanities and ecocultural theory contribute? For an answer, I return to environmental philosopher Val Plumwood’s *Environmental Culture*. HPS would need to reconstitute subject-object and disciplinary dichotomies that posit plants as passive and the study of plants as empirical only. To this effect, Plumwood advocates an “ecologically-integrated humanities knowledge field” ([16], p. 51). For Plumwood, the “ecological humanities” bridge “the great split ...between nature (science) on the one hand and culture (philosophy and the humanities, cultural studies) on the other” ([16], p. 51). In Plumwood’s view, plant research, most commonly associated with the sciences (botany) or social sciences (anthropology and ethnobotany), is restricted to “the sphere of the ‘objective’...where the subject/object constructions reign supreme” ([16], p. 52).

Echoing Plumwood, anthropologist Deborah Bird Rose and historian Libby Robin argue that the ecological humanities bridge dichotomies intrinsic to Western thinking about nature through an “ontology of connectivity” [21]. Canonical works in the ecological humanities, such as Carolyn Merchant’s *The Death of Nature*, portray nature as “an *active partner* rather than *passive accessory* in the unfolding of human communities [*italics added*]” [78]. Through the premise of connectivity between plants and society, HPS would provide a framework for conceptualizing plants as active partners in knowledge production and cultural practices, “as social beings with agentive efficacy” ([69], p. 183). HPS would investigate plants and everyday human-plant interactions—for example, South African botanical species in Western Australia (see Figure 5)—towards a reconsideration of “planthood.” Hence, HPS would align closely with the theoretical advances of the ecological humanities, as well as the methodological precedents of ecocriticism [41]; ecocultural studies [17]; human-animal studies [58]; human-plant geographies [10,11]; multispecies ethnography [69]; and biosemiotics [49,79].

Figure 5. Exotic *Gladiola* spp. plants alongside a railway line near Bunbury, Western Australia. Termed “invasive” and “opportunistic,” weeds often exhibit adaptive group behaviors that enable them to establish vigorous populations around the world. Should weeds like this beautiful *Gladiola* be known as obnoxious pests or intelligent colonizers? (Image source: Author)



Importantly, this framework would look towards Indigenous knowledges in reconceptualizing these divides [7,80]. Intrinsic to Aboriginal Australian relations to non-human beings, kinship (involving totemism and custodianship) expresses a “connectivity ontology” between plants and people ([7], p. 58; [21]). Philosopher Mary Graham outlines two axioms of Aboriginal philosophy: (a) the land is the law and (b) you are not alone in the world, the former signifying that “meaning comes from land” and the latter, “a kinship system which extends into land.” The stories of different clans describe “Creator Beings,” including plant beings, that enabled sleeping “proto-humans to become fully human” [80].

The interdisciplinary focus of HPS would bring about novel research approaches—steeped in ancient ontologies—in which plants and human-plant interactions and social relations might be better understood. HPS would conceptualize botanical intelligence broadly as a syncretic quality emerging from intelligent systems and encompassing the potentiality for plants to become “persons,” as central to particular Indigenous worldviews. Most crucially for the development of human-plant studies is the differentiation between botanical intelligence—plants *acting upon* people to co-orchestrate cultural beliefs and practices in the *umwelt* of living organisms—and the intelligent use of plants—people *acting upon* plants in utilitarian and potentially exploitative ways that posit “intelligent” animals against “passive” plants. The ecological humanities afford a strong basis for this further articulation of human-plant studies. Above all else—as Hall, Plumwood, Rose, and Robin suggest—HPS implies an ethics of research involving care and connectivity with plants. Such dialogical approaches—to be advanced further within HPS—regard nature as an agent in knowledge formation and “articulate ethical and social engagement with respect for what is studied” ([16], pp. 55–56). Extending the animal and society precedent, human-plant studies would interrogate the history of “human” and “plant” (and their association in Western ontology), the latter laden with connotations of passivity and

the former with presuppositions of intelligence. This call for interdisciplinarity posits plants, their intelligences, and their social and cultural relations as productive areas for research to be explored further from a myriad of perspectives. As Marder asks, “and what would it mean to write and think in a vegetal—if not a vegetative—state, having left one’s head behind or walking on one’s head? What is the outcome of our approximating the locus of vegetal being?” ([13], p. 474).

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