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Relationality and Metaphor—Doctrine of Signatures, Ecosemiosis, and Interspecies Communication

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Abstract: The Doctrine of Signatures (DoS) figures prominently in both contemporary and historic herbal traditions across a diversity of cultures. DoS—conceptualized beyond its conventional interpretation as "like cures like", which relies solely on plant morphology—can be viewed as a type of ecosemiotic communication system. This nuanced form of interspecies communication relies on the presence of "signatures", or signs, corresponding to the therapeutic quality of different plants based on their morphology but also their aroma, taste, texture, and even their context in the landscape. Despite its widespread contemporary dismissal by mainstream science as overly simplistic, childlike, primitive, and generally of limited value, we suggest that the recognition of "signatures" in plants may be considered as a form of communication between humans and plants. Drawing upon Indigenous thought, ecosemiotic theory, and lyric philosophy, we posit that understanding "signatures" metaphorically, as a reflection of the "shape of the world", offers insights into the interconnectedness of all life forms—a profound affirmation of relational coherence between humans and the more-than-human. We advocate for another perspective on DoS: one which holds potential towards reorienting and restoring our relationships in the vibrant world of the Anthropocene.

Keywords: Doctrine of Signatures; indigenous thought; ecosemiotics; interspecies communication; lyric philosophy; relationality; herbal medicine; psychedelics

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1. Introduction

Human relationships with the living world—plants in particular—have had and continue to have a marked influence on the development of major features of human bodies and cultures (Schaal 2019) [1]. The evolution of plant medicine knowledge is often oversimplified as an arbitrary trial and error process, yet careful consideration suggests this explanation to be highly unlikely (Hart 2005) [2]. The notion of an evolved disposition to seek "markers" or "signatures" in plants/plant parts that correspond to the action needed to reverse an ill state is far more plausible. In this context, signatures represent therapeutic properties of a given plant and at least in part characterize the human–plant relationship. During the European Middle Ages, Paracelsus and his followers deployed considerable effort towards comprehensively integrating form into the understanding of plant medicinal qualities. They encompassed their observations into a Doctrine of Signatures (DoS), in which "form recapitulates function—physical characteristics of plants reveal their therapeutic function" (Bennett 2008, p. 246) [3]. The DoS is still widely cited, although most often ridiculed, in the contemporary literature on western plant medicine (Bennett 2008) [3].

The notion of signatures in plants has been important or even central to the evaluation of their possible medicinal qualities across many cultures, places, and times, well before Paracelsus codified this practice in the DoS. For instance, for thousands of years in the Ayurvedic tradition of India, taste (or rasa) serves as a fundamental criterion for identifying pharmacological properties of plants used in Dravyaguna, its system of phytomedicine (Joshi et al. 2006) [4]. Traditional Chinese Medicine attributes different qualities and elemental value to colors. Color, in this tradition, is said to "reflect assumed qualities which are

inherent to matter" (Lee 2012, p. 157) [5]. Similarly, the Popoluca of southern Veracruz, Mexico, associate color, taste, and form with medicinal qualities in plants (Leonti et al. 2002) [6]. The use of signatures is ubiquitous, and many have suggested it to be a near universal phenomena (Bennett 2008) [3].

While some criticisms of DoS may be valid, its outright dismissal stems from assessing its value under the sole light of a mechanistic worldview, failing to account for the relational aspect of this episteme. Worldviews involve more than differences in the ways in which the world is viewed but differences in the ways in which the world is experienced. As argued by Kohn (2013) [7] in "How Forests Think", we need to rethink representation as a process to decolonize thoughts and to perceive more clearly how thinking and agency are not unique to the human experience. We see representation in the context of DoS as a metaphoric world-making process that troubles both human exceptionalism and its implicit assumption that humans are somehow separate from or independent of the rest of the world.

This argument is fundamental to the ideas that are developed through our paper. We are aware of the limitations of DoS, namely the potential for oversimplification in interpretation of signs and symbols. We contend, nonetheless, that this approach may offer insights regarding plant communication, opening possibilities towards "that which happens by virtue of *a certain unfaithful power of connectivity*" (Houle 2015, p. 56) [8]. Houle leverages Deleuze and Guattari's concept of "becoming with", referring to the scalar intensification that occurs in the proximity of the space of encounter, to engage botanical beings in philosophical discourse, decentralizing anthropocentric perspectives. "Becoming with" involves the effacement and augmentation of the distinct forms and functions of the parties in communication, making possible a provisional co-creation, a "becoming". As such, we propose to revisit DoS specifically under the lenses of ecosemiosis and lyric thought in this paper.

The authors both share lifelong relationships with plants and fungi. K.W. has worked with Indigenous and local communities across Canada and around the world on plant-related projects, typically focusing on the traditional uses of food and medicine plants. One author (initials removed), who has paternal familial roots from a Kanyen'kehà:ka (Mohawk; Haudenosaunee) community on the northern shores of Lake Ontario, draws heavily on Haudenosaunee thought and traditional botanical knowledge to inform his thinking and life more broadly. The other, A.-A. B. is a practicing clinical herbalist with many years of experience in the clinic and in community-based education. Both are avid gardeners and gatherers who have worked in Indigenous contexts. We draw examples from many plant medicine traditions but emphasize Indigenous understandings from Turtle Island (North America), reflecting our personal connection and commitment to the territory, the Indigenous communities and the knowledge systems of this place.

2. Doctrine of Signatures as Ecosemiotic System

Ecosemiosis, as an offshoot of Peirce's semiotic theory, involves the communication of meaning through interactions between sign, object, and interpretant in the context of biological systems whether at the level of the individual, population, community, or ecosystem and potentially across those levels of organization (Maran 2017) [9]. In simple terms, a sign communicates something of significance about an object for the interpretant (Short 2007) [10]. For example, goldenseal (*Hydrastis canadensis*), an herbaceous perennial in the Ranunculaceae family, possesses a bright yellow (the sign) rhizome (the object), which signifies to the Indigenous gatherers (the interpretants) its usefulness in addressing symptoms of liver dysfunction. The liver, when compromised, cannot process bilirubin. This yellow pigment, when present in sufficient volume in the human body, causes jaundice—a yellowing of the skin (Roche and Kobos 2004) [11]. Goldenseal rhizome is used traditionally by the Haudenosaunee—formerly known as the Iroquois, an Indigenous Peoples from the Great Lakes region of present-day Canada and the United States—for several purposes, including the treatment of biliousness and other liver problems (Herrick 1995) [12]. Goldenseal's rhizome (the object) is bright yellow in

color (the sign), which signifies usefulness in treating symptoms generally associated with liver conditions to Indigenous gatherers (the interpretants).

Peircean semiosis describes three types of signs—icons, indices, and symbols. Icons are a kind of likeness that resembles the object, or qualities of the object, that they represent. For instance, in traditional Chinese medicine (TCM), ginseng roots (*Panax quinquefolius*) in a shape that have a similar appearance to a human are highly sought after as a panacea (Potenza et al. 2023) [13]. In modern phytopharmacology, ginseng-unique saponins are credited for this plant's exceptional capacity to improve physical vitality, modulate immunity and protect against cancer (Shi et al. 2019) [14]. The roots' iconic resemblance to a human, according to TCM, broadly indicates the unusual capacity of this plant to support human health. Indices gesture towards "real connections" between the sign and the object (Peirce 1992, p. 461) [15]. For the Nlaka'pamux of British Columbia's southern interior, the flowering of wild rose (*Rosa* spp.) is indexed to the ripening of the "heart tonic" soopolallie (*Shepherdia canadensis*) berries (Turner and Reid, 2022 [16]; Turner, 2014 [17]). In other words, wild rose flowers are ready to gather at the same time that soopolallie berries are ripe and ready to gather. Finally, symbols, belonging to a more complex realm, "refer to an object indirectly by virtue of the ways in which they relate systematically to other such symbols" (Kohn 2013, p. 32) [7]. For example, the color "white" or "shining" in Haudenosaunee culture evokes the appearance of the water's surface. It is viewed as a portal to the spiritual world and in that way is very powerful. When white or "shining" is invoked, it is conceptually associated with the spirit world, power, death, healing, good/bad, and many other things depending on context (Herrick 1995) [12]. White appears as the color of water hemlock's flower (*Cicuta maculata*), the so-called "Iroquois suicide plant" and the roots of the great white pine tree, whose "white roots of peace" spread throughout the world and are the conduit for sharing the message inherent in the Great Law of Peace, a Haudenosaunee body of sacred teachings (Herrick 1995) [12]. The color white is interpreted through a system of related symbols, the meaning of which is mediated by context.

Deacon's influential perspective on semiotics maintains that icons, indices, and symbols are organized in a nested and directional compositional hierarchy in which icons compose indices and indices compose symbols, in that strict order. Deacon's work involved mapping this nested hierarchy onto the evolution of life on Earth such that icons appeared first, followed by indices. Symbols, according to Deacon, emerged coincident with the evolution of humankind. Deacon's hypothesis suggests that humankind represents the pinnacle of communicative sophistication and assumes that humans are the only organisms capable of symbolic thought, which is at odds with Indigenous views of agentic nature (Deloria and Wildcat 2001) [18] and recent findings in animal behavior (Addessi et al. 2008 [19]; Cunha and Rhoads 2021 [20]; Herman et al. 1993 [21]).

Stjernfelt (2012) [22] offers a compelling argument against Deacon's hypothesis. For Stjernfelt, the icon–index–symbol triad does not represent absolute, reified categories, but rather each type of sign can co-exist as an aspect of any given sign. Stjernfelt illustrates this point using the classic Pavlovian response. The ringing bell indexically suggests the imminent arrival of food to the conditioned dog according to Deacon's thinking. However, this communication is also symbolic: "the bell sound is a general type, referring, in turn, to another type, that of eating, a potential multitude of future eating situations" (Stjernfelt 2012, p. 41) [22]. Stjernfelt importantly observes that Deacon's sign types are neither mutually exclusive nor compositional—rather, where they co-occur, they are best viewed as facets of the same sign, all of which contribute to the communicative relationship between the elements of the semiotic system. Sign types complement, or as Stjernfelt suggests, "collaborate" (p. 42) [22] with one another, generating a rich semiotic terrain. Icons that occur without either of the other two sign types "are much too vague to communicate any information of value because their content is merely possible and does not relate to the actual world" (p. 42) [22]. Indices are "attention-directing and based on the here-and-now, they are unable to perform the central task of orienting and guiding biological activity into the future" (p. 42) [22]. Finally, "in order to be understood, a symbol must bear

information in the shape of an icon and relate that information to an object by means of an index" (p. 42) [22]. While "pure" signs can exist (e.g., a sign that is solely iconic), they are marginal and of peripheral communicative value. Stjernfelt clearly articulates the symbolic nature of the ringing bell for Pavlov's dog. Symbolic meaning-making may not be as easy to conceptualize in the plant kingdom. However, recent scientific research suggests that plants can also imagine future possibilities and can learn (Hemenway and Gehring, 2023 [23]; Ponkshe et al., 2023 [24]). The porosity and complementarity of Stjernfelt's view of the icon–index–symbol triad allows us to imagine a horizon of complex and profound communicative relationships between humans and plants beyond the unidirectionality suggested by more conventional semiotic perspectives. The following paragraphs offer examples of plant–human communication according to sign type. For each category, we first focus on plants that are part of a DoS relational complex with humans but expanded beyond DoS examples to more fully illustrate the ways in which plants and humans communicate using various sign types.

Goldenseal's yellow root color is an example of an icon signifying activity related to conditions associated with hepatic pathologies. The yellow coloration of the plant is due to the presence of the benzylisoquinolone alkaloid berberine (Khin et al. 2020) [25]. This compound, as well as other biologically active alkaloids present in *Hydrastis,* has evolved over time through complex and delicate metabolic pathways to function as a defense and/or as signal compound for the plant (Wink 2003) [26] in its native woodlands.

Goldenseal has both indexical and symbolic ecosemiotic properties. Goldenseal's typical habitat could be viewed as an index. In Canada, goldenseal is restricted to deciduous riparian zones and seasonally flooded locales in upland areas. Goldenseal tends to live in acidic to slightly alkaline clay to sandy loam soils in mature woods with 50–70% canopy cover and some disturbance. Goldenseal tends to grow alongside trees such as shagbark hickory, ironwood, basswood, elm, raspberry, and spice bush (Sinclair 2019) [27]. Encountering habitats with some (or all) of these properties serves as an indexical sign indicating a place where goldenseal might grow to the gatherers (interpretants). Finally, United Plant Savers (UPS), an American non-profit devoted to the conservation of medicinal plants, features goldenseal on their logo (UPS 2023) [28]. In this instance, goldenseal is symbolic of endangered medicinal plants more broadly.

Similarly, the lungwort lichen (*Lobaria pulmonaria*), an arboreal foliose species that looks like lung tissue, has been used traditionally in the western world to treat pulmonary ailments (Crawford 2019) [29]. Human interactions with—and understanding of—lungwort have been informed by, amongst other things such as its high swelling index and availability through winter months, when respiratory illnesses are most prominent, based on the physical resemblance between this lobed lichen and human lung tissue.

Another eastern woodland plant, the mycoheterotroph commonly known as ghost pipe (*Monotropa uniflora*), has been used by Indigenous peoples and settlers alike as an analgesic (Moerman, 1998 [30]; Turner, 2018 [31]). *Monotropa uniflora* lives in mycorrhizal association with over a dozen species of *Russula* and two species of *Lactarius* mushrooms, which are closely related to *Russula* (Bidartondo and Bruns, 2002 [32]; Yang and Pfister 2006 [33]). This indexical relationship is not foreign to the Nlaka'pamux people of British Columbia's southern interior who rely on ghost pipe as a kind of phenological predictor. For the Nlaka'pamux, an abundance of ghost pipe indicates a good upcoming mushroom season (Turner et al. 1990) [34].

Likewise, maize or corn (*Zea mays*), is a highly symbolic plant among the Indigenous peoples of Turtle Island. Corn is profoundly implicated in the Haudenosaunee creation teachings as a gift from Skywoman's daughter (Cornelius 1999) [35]. In addition to being one of the Three Sisters, or "our sustainers", corn silks, stems, and leaves have traditional medicinal and ceremonial uses in the Haudenosaunee world (Parker 1910) [36]. Corn figures prominently in many Haudenosaunee ceremonies and is also present in symbolic beadwork and other aspects of the material culture of the Haudenosaunee (Herrick 1995 [12]; Hill 2017 [37]; Holler 2012 [38]). Rarámuri ethnobotanist Enrique Salmón

(2020) [39] summarizes the importance of corn to Indigenous Peoples of the Americas in the following passage:

> Corn is central to American Indian beliefs, identity, culture, and foods. It is more than food. It is also a medicine, used in crafts, and in construction. In addition, we feel that we are directly related to it. (p. 74) [39]

When corn is encountered or invoked among many Indigenous peoples of Turtle Island, it is within a complex symbolic cultural matrix laden with significance. Ecosemiotic signs associated with corn elude separation into discrete categories of icon, index, and symbol. Rather corn signs seem to typically encompass at least two of the three categories of signs per Stjernfelt's (2012) [22] suggestion that sign categories are, in fact, porous and not mutually exclusive. In addition to corn's highly symbolic nature, corn signs are also iconic and indexical. For the Haudenosaunee, corn is emblematic of resilience borne of reciprocity, in which humans care for the corn and the corn cares for us (Stevens and Brewer 2019) [40]. This symbolic association of mutual care is extended by the ways in which the Three Sisters polyculture—consisting of corn, beans, and squash—is understood as mutual care between each member of this polyculture system: corn provides a tall stalk for bean tendrils to climb, the beans fix atmospheric nitrogen into plant-available forms, and the squash leaves prevent desiccation of the shallow-rooted corn plants (Cornelius 1999) [35]. When corn is encountered, even in isolation, it is indexed to the other members of the Three Sisters polyculture and symbolically interpreted as illustrative of the importance of mutuality in the human and more-than-human worlds. Corn leaves, according to Webster (2023) [41], wrap around and protect the corn kernels much the way children are safeguarded by layers of protection until they reach adulthood. This iconic resemblance between corn husks and child-rearing practices serves to index the raising of children with forms and patterns in the corn field, or more accurately, the Three Sisters mounds—which themselves iconically and symbolically evoke the breasts of Skywoman's daughter from which corn was said to originate (Cornelius 1999) [35]. Corn, central to Haudenosaunee cosmology, is a symbolic reminder of the lessons associated with the creation teachings such as the importance of living a ceremonial life, that gratitude for all life must be expressed collectively, and that work is required to sustain human life (Herrick 1995) [12]. Growing traditional corn varieties; saving seed; preparing corn for consumption through the ancient process of lye-washing (nixtamalization); and sharing corn with family, friends, neighbors, and wild animals serves—from the authors' lived experience—to index the survival of Indigenous peoples and Indigenous identity within the context of hundreds of years of colonial occupation. In many traditional stories, corn is characterized as a person, even assuming human form (Parker 1910) [36]. This recognition of corn's personhood informs Haudenosaunee conceptions of, and interactions with, this culturally significant plant.

Peirce takes a broad view of symbols. Among other characteristics, Peircean symbols refer to the potential continuity of future objects, for example the "potential multitude of future eating situations" (Stjernfelt 2012, p. 41) [22] as imagined by Pavlov's dog. Like Pavlov's dog, plants can, in their way, imagine a future that meets their biological needs. Plant roots growing towards zones of relative nutrient abundance exemplify this future-oriented imperative (Affifi 2013) [42]. Kull (2000) [43] describes an experiment in which a seedling was grown with a cap on top of the pot leaving the seedling in almost total darkness. Two holes were cut at the top of the pot, angled at a distance from the shoot. One of the holes was situated to allow low-intensity light (insufficient for photosynthesis), and the other hole admitted no light. The plant grew towards the low-intensity-light-admitting hole, which demonstrates, according to Kull, a choice on the part of the plant. This tropism is both indexical and symbolic. Although insufficient to meet the plant's photosynthetic needs, the low-intensity light signifies the possibility of higher-intensity light nearby which could presumably meet the metabolic needs of the plant in question.

In "How Forests Think", Kohn (2013) [7] describes an Amazonian Indigenous world in which humans, the rainforest's animals and plants, as well as various spiritual beings exist in a communicative web. The myriad forms evident in the Amazon—hierarchical,

diffuse, linear, circular, rhizomatic, arborescent, and reticulated—inform the relationships actualized between beings and possible future relationships. Similarly, the form of our hominid skull has adapted to various elements of our natural environment through millions of years of myriad selection pressures including co-evolution with the more-than-human. *Australopithecus africanus*, a hominid living during the Middle Pliocene of South Africa, presents large molars, thick enamel, mandibles with large and robust bodies, exaggeratedly large masticatory muscles, and substantial bony buttressing of the face (Strait et al. 2009) [44], indicating their reliance on foods with strong protection, such as large nuts and seeds or dense roots for sustenance, during periods where their preferred foods were unavailable. The shape and structure of the skull enabled the mastication of such tough plant material (Schaal 2019) [1] and can be described as a sign representing different features of the environment in which *A. africanus* lived.

The DoS, when viewed holistically, exemplifies each of the three sign types. Often, multiple sign types co-exist in a specific plant-human ecosemiotic relationship, as evidenced by the examples discussed earlier in this section. At a fundamental level, DoS relies on icons or similarities to identify the activity of a given medicinal plant. Indexes and symbols, as complementary aspects of a given ecosemiotic system, serve to situate communication in the actual and symbolic worlds. As mentioned earlier, in the Haudenosaunee culture, plants with one or more yellow parts (e.g., goldenseal) are useful for treating liver conditions, a symptom of which is jaundice (Dong et al. 2020) [45]. Although critiqued as antiquated and primitive (Bennett 2008 [3]; Efferth and Greten 2016 [46]), we suggest that the DoS speaks to the enfoldment of plants and humans in a shared semiotic web. The forms and patterns of the natural world, particularly the botanical world, offers a near infinite range of communicative pathways in the plant–human ecosemiotic relationship. The diversity of plant forms and patterns suggests at least an equally diverse potential for the emergence of new ways of thinking.

Ecosemiosis could be viewed as inherently relational. Without an interpretant (or an "object" with which the interpretant interacts), ecosemiosis is impossible. In an earlier co-authored paper, one of the authors of this work (removed for peer review) [47] describes the Haudenosaunee notion of relationality using a wooden table as an example (Williams and Brant 2022) which illuminates an ontologically relational and temporally dynamic conception of identities:

> The Haudenosaunee worldview does not figure objects or individuals as static. For example, a wooden table is in a constant state of flux or transformation. It is composed of all the interactions it had as a tree in the forest; as wood in the workshop; as a table used for eating or other purposes; and as food for insects, fungi, and other decomposers when it eventually breaks down and returns to the ecosystem. This vibrant dynamism extends to humans, medicine plants, rivers, animals, and the rest of Creation. (p. 211)

The scope of ecosemiotic possibility explodes when identities are construed as relational and the past, present, and future are in a state of continuous becoming (Barad 2007) [48]. Our relationships with the medicine plants are dynamic and manifold, similar to the distributed relationality associated with the wooden table in the above quoted paragraph. Our identities as gatherers of medicine plants encompass all the past and future relations that we as humans had, and will have, with those plants going both backwards and forwards in deep time. This relationality is complexified when we consider all the other beings that support our medicine gathering, both living such as the pollinators, mycorrhizal fungi, and seed dispersal agents, and what western science refers to as "non-living", such as rocks, the waters, the winds, and celestial bodies. Cultivating these relationships with the medicine plants, our ancestors and theirs, and our future ancestors is one way to achieve what Sheridan and Longboat (2006) [49] refer to as "old-growth mind". For Sheridan and Longboat (2006, p. 366) [49]: "Old-growth minds and cultures mature, emerge, and encompass the old growth of their traditional territory. Haudenosaunee minds are congruent with their traditional territories

but more importantly, Haudenosaunee minds are required to accomplish that symmetry in accomplishing their authenticity".

3. Multispecies Communication and Distributed Agency

Interspecies communication suggests an exchange of knowledge and/or perspectives between members of different species (Barrett et al. 2021) [50]. Recent scientific evidence suggests that members of a given plant species have the ability to both communicate with one another and also with other species of plants and animals. For instance, Calvo and Lawrence (2022) [51] report that tobacco (*Nicotiana attenuata*) growing in proximity to browsed sagebrush (*Artemisia tridentata*) experiences less damage from herbivores due to an increase in the release of unpalatable volatile organic compounds (VOCs) that presumably alert animals to the toxicity or, at least, the unpalatability of the tobacco plant. As far as we know, this communication between tobacco and sagebrush is one-way: from the browsed sagebrush to the nearby tobacco plants. However, communication between the tobacco and herbivores is two-way. The tobacco produces disagreeable volatiles, and the animal browses less of the plant than if the plant had not produced those VOCs. For the tobacco, the volatiles released by the sagebrush serve as an index of the threat of herbivory. For the herbivore, the compounds produced by the tobacco index the toxicity of that plant. This example demonstrates that the reductionist notions of one-way and two-way communication may be insufficient to describe the polyvocal multiplicity of conversations occurring in the more-than-human realm.

Communicating with plants, animals, and other elements of the natural world is foundational to Indigenous cultures of Turtle Island and probably the rest of the world (Hogan 2020 [52]; Turner 2014 [17]). Many traditional stories, themselves instructive, serve to illustrate the communicative relationship between humans and plants, humans, and fungi. For example, among the Nuxalk of British Columbia's northwest coast, blueberries (*Vaccinium* spp.) are figured in traditional stories as boys who teach a woman about appropriate berry-picking etiquette (Turner and Bell, 1973 [53]). For the Haida, an Indigenous people from Haida Gwaii, British Columbia, Tree Fungus Man—a personified polypore (possibly the artists' conk, *Ganoderma applanatum*)—is a central actor in the story describing the origin of women (Turner 2014) [17]. Among the Haudenosaunee, corn sometimes appears in human form. The prophet Handsome Lake received a vision from spiritual messengers in the form of anthropomorphized corn plants, at the end of the 18th Century, who shared teachings with him that later became the foundation of the highly influential teachings known as the Handsome Lake Code which offered the Haudenosaunee guidance for maintaining their ways of being despite the ongoing acculturative aspects of the colonial project (Antone, 2013 [54]; Johansen and Mann, 2000 [55]). Numerous Indigenous groups in the Amazon region use the psychedelic beverage known as ayahuasca. Ayahuasca is typically composed of at least two plant species: the yage vine (*Banisteriopsis caapi*) and either chacruna (*Psychotria viridis*) or chagropanga (*Diplopterys cabrerarna*), all of which are known as "plant teachers" because they share information with the traditional healer, such as the use of specific medicinal plants and how to perform certain shamanic activities (Luna 1984) [56]. Luna (1992) [57] describes the two-way communication between the spirits of the Amazonian ayahuasca admixture plants and the traditional healer based through the use of icaros or traditional healing songs:

> It seems the preeminent mode of communication between the shaman and the spirits is through magic chants or melodies. The spirits often present themselves to the shaman while singing or whistling a particular *icaro*. When the shaman learns these *icaros*, he can use them to call on the spirits when he needs them. By singing or whistling the *icaro* of the plant teachers, the shaman invites the spirits to present themselves. Also, the guardian spirits, which may be anthropomorphic or theriomorphic, that all informants claim to possess are called through *icaros*. (pp. 240–241) [57]

One of the co-authors of this paper has worked with several knowledgekeepers from different Indigenous nations, who communicate directly with plants much in the same way that Luna (1984 [56]; 1992 [57]) describes in the Amazon. These knowledge keepers' experiences also echo the way that human-plant interactions are figured in both Haudenosaunee territory, and in Indigenous cultures of the Pacific Northwest. This living tradition of Indigenous interspecies communication, like human–human communication, exhibits the full-range of semiotic sign-types, including the symbolic. Unfortunately, we cannot share details of these communicative experiences without prior consent from the knowledge keepers however, we can share other published examples of symbolic signs associated with fungi. One of the traditional names for the so-called "magic mushrooms" (*Psilocybe* species) translates as "sacred mushroom that paints or describes" by the Nahua, an Indigenous People from central Mexico (Guzmán 2008, p. 409) [58], which suggests a symbolic communicative relationship between the fungi and the traditional healer. The Mazatec, from the mountains of Oaxaca state in Mexico have a rich and unbroken tradition of sacred mushroom use. Mazatec curandera Maria Sabina's metaphoric and symbolic encounters with the Creator, after having consumed *Psilocybe* mushrooms, who appears as a tree, a mountain, and as a book. These are just a few of the symbolic correspondences inherent in Mazatec understandings of the mushroom experience (Sabina 2003) [59]. A skeptical Western mind, steeped in Cartesian dualism, might attribute these metaphoric relations as flights of the imagination. However, these framings take on an entirely different character when understood in the context of kincentric ontologies that recognize the animacy of all matter.

Observing medicine plants and interacting with them inspires ways of thinking and being that are alternative to the extractive individualism and mechanistic logic dominant in Western culture. Plant learning and communication operates at both an evolutionary timescale (e.g., alkaloids in goldenseal rhizome evolving as a mode of defense against herbivory and as potential signaling compounds) and at the level of the lifespan of an individual plant (e.g., roots growing towards areas of relative nutrient abundance), as we can see from the examples discussed earlier in this section. Plant response ability, as a way of describing non-human agency (Barad 2007) [48], is also distributed across populations and communities. For instance, Suzanne Simard (2021) [60] reported on some radioactive isotope experiments in which she found that on cut-blocks, paper birch (*Betula papyrifera*) seedlings did not compete with the Douglas fir (*Pseudotsuga menziesii*) seedlings for photosynthetic carbon. Rather, through their common ectomycorrhizal networks, they shared carbon. Indigenous cosmovisions such as those associated with ayahuasca in the Amazon, *Psilocybe* mushrooms in the Sierra Mazateca, or the Three Sisters in the Great Lakes region all recognize the communicative web of agentic relationships in which we are all embedded. This distributed agency is also evident in the multispecies communicative matrix suggested by the herbivore–tobacco–sagebrush relationship discussed earlier in this section.

Plants, like humans and other animals, respond and communicate over evolutionary and individual time. Additionally, like plants, human communication occurs within one individual (e.g., cell–cell communication), between people, and across populations and communities. Despite these similarities, westerners tend to think of humans from a highly individualistic perspective perhaps, because this is the most obvious and immediate scale at which humans communicate, but also perhaps because western culture is itself highly individualistic (Oyserman et al. 2002) [61]. Old-growth minds can be nurtured by learning multi-generational, collectivist, and distributed thinking and living from observing and interacting with plants in our home territories, especially through approaches like the DoS.

4. Signatures and Lyric Thought

DoS has been poorly received by the western medical mainstream despite the prevalence of DoS in traditional herbal practices across the world, including western herbalism. Bennett (2008) [3] suggests that the DoS, contrary to accepted wisdom, is not an example of an a priori indication of medicinal value but rather plays an important role as a mnemonic

device for remembering and teaching about the therapeutic properties of medicinal plants. While we agree with Bennett that the DoS can serve as a useful aide-mémoire for herbalists and learners, the real strength of the DoS is that it can support a more wholistic relationality with the vegetal more-than-human when viewed through the metaphoric lens that is central to lyric philosophy (Zwicky 2014) [62]. Stjernfelt's perspective on semiotic signs may not be easily digestible to those steeped in western analytic and scientific thought with their emphasis on linearity, reductionism, and mechanistic causation (Haraway 2016) [63]. Instead, we suggest that lyric philosophy may offer a more generative approach to understanding ecosemiotic sign processes, including the DoS.

Lyric philosophy attempts to unite logicolinguistic, or rational, approaches to understanding the world with lyric thought. Lyric thought "is an attempt to comprehend the whole in a single gesture" as a kind of gestalt (Zwicky 2011, p. 73) [64]. Lyric thought attends to complexity and specificity, seeks coherence through resonance, uses metaphor as both a device to actualize lyric thought and exemplar of it, combined with logico-linguistic or rational epistemological approaches (Zwicky 2011) [64]. Zwicky (2014) [62] illustrates her conception of lyric philosophy by drawing on the example of a guided tour of a wetland. A guided tour may offer some initial impressions of a wetland including sightings of characteristic species, but it cannot yield an understanding of the complex dynamics animating this ecosystem, which, she infers, can best be understood by uniting metaphoric and logicolinguistic modes of thought. The following few paragraphs develop some of the ideas expressed here, namely the gestural root of meaning, metaphor, and Gestalt theory.

Zwicky (2014) [62] points out that "language is a limited instrument—vast, supple, complex, but limited" (p. 20) and that form as gesture is the root of all meaning. Put simply, and in the broad sense, "how you say is what you mean" (Zwicky 1995 in Heiti 2015, p. 189) [65]. The DoS relies heavily on form as gesture as a vehicle for interspecies communication. According to Zwicky (2014) [62], "the capacity to recognize other beings' gestures for what they are—expressions of experience like our own—is the capacity to experience meaningful coincidence of context" and "this capacity—a sensitivity to resonance—is what we call imagination" (p. 21). Zwicky's assertion bears a remarkable similarity to, and compatibility with, Haudenosaunee notions of imagination. "The ecology of traditional Haudenosaunee territory possesses sentience that is manifest in the consciousness of that territory, and that same consciousness is formalized in and as Haudenosaunee consciousness" and original, unassimilated old growth minds are borne from alignment with place and the myriad beings with whom we co-exist, according to Sheridan and Longboat (2006, 366) [49]. The DoS, as one of a suite of human–plant interspecies communicative approaches, also offers humans the opportunity to nurture our old-growth minds by cultivating a sensitivity to resonance with the more-than-human world. For instance, among the Wixárika of Mexico's Sierra Madre Occidental, hikuri (peyote; *Lophophora williamsii*) and maize (*Zea mays*) are two of the three members of the sacred deer–maize–peyote complex (MacLean 2012) [66]. For the Wixárika, deer, maize, and hikuri "are a unity, they are one, they are ourselves" (Myerhoff 1968, p. 264) [67], and they are central to Wixárika cosmology and way of life and are construed by the Wixárika in both literal and metaphoric terms (Myerhoff 1970) [68]. Symbolically, the deer represents the past life of the Wixárika—a life based on deer hunting exemplified by freedom, independence, and masculinity. Maize stands for domesticity, routine, and persistence. The hikuri represents quiet beauty as well as the spontaneity and unpredictability of existence (Myerhoff 1968) [67]. The annual hikuri hunt serves as a "commemoration, repetition, and re-enactment of a primordial hunt for Deer-Person" (Fikes 1985) [69]. Deer-Person is a tutelary spirit that takes the form of hikuri in this sacred hunt. By consuming hikuri-as-Deer-Person, the Wixárika seek to learn from this spirit, embodied by peyote. Deer-Person in the form of hikuri communicates directly with the ceremonial participant by teaching them songs, such as the amaranth song, which is used for healing purposes. More broadly, eating hikuri as part of this ceremonial hunt, through a kind of sympathetic magic, allows the ceremonial participant to access the memory, knowledge, and even the being of Deer-Person (Fikes 1985) [69]. Deer-Person, or Kayumari, is responsible for maintaining the cosmic order and ensuring the continuance of existence which then becomes

the responsibility of the ceremonial participants, as well. Ceremonial activities associated with the hikuri hunt include the hikuri ceremony—an element of which involves parching maize over a fire to bring for the rains necessary for maize to grow and for the sustenance of Wixárika life (Myerhoff 1968) [67]. The Wixárika world is rich in symbolism, and we suggest that the Wixárika deer–maize–hikuri complex exemplifies lyric thought. Encountering any member of the sacred complex evokes, via gestalt, a complex web of relations and responsibilities. Various elements of the hikuri hunt embody Zwicky's suggestion that "how you say is what you mean" (Zwicky 1995 in Heiti 2015, 189) [65].

Hikuri, according to a Wixárika person interviewed by Fikes (1985) [67], says "if you come to know me intimately, you shall be like me and feel like I do" (Fikes 1985, p. 188) [69]. While a full study of interspecies communication inherent in the psychedelic experience is beyond the scope of this paper, it is worth noting that hikuri's invitation to become-with (Haraway 2003) [70] is an example of perspectivism, a core ontological boundary-crossing element of animist ontologies, in which humans shift their frame of reference to directly experience other subjectivities, typically those associated with non-human persons (Viveiros de Castro 1998) [71]. Further study of the psychedelic experience, particularly in Indigenous ceremonial settings, could elucidate the ecosemiotic dimensions of the communication between sacred plant medicine and ceremonial participants.

The scientific paradigm underlying modern medicine's logic is itself not foreign to metaphors. For example, when we refer to "messenger" ribonucleic acid (RNA), we metaphorically express that genetic information is conveyed from DNA to the ribosomes, where it will determine the amino acid sequence that will generate specific proteins. This metaphor evokes a messenger relaying information between parties, a relatable image which aids in understanding the complex and obscure processes at hand (Sexton and James 2022) [72]. Furthermore, as articulated by Neilson (2015) [73], the narrative of progress characteristic of modern-day western culture colors the field of medicine with a logic of metaphorical progress. For example, in medical textbooks, our understanding of pathophysiology is pictured as evolving from primitive to sophisticated. In biochemical terms, this is incontestable. "Yet in a paradoxical way, the progress narrative has been [. . .] obliterated by the metaphor of progress." (Neilson 2015, p. 4) [73]. Progress becomes the narrative, obscuring the experience of the person. Mechanical reductionism, although exceptionally useful at elucidating singular pathways of activities and developing novel solutions to acute medical challenges, does not reveal the true complexity of the living and can be misleading if mistaken for the whole.

The use of metaphors is rich in the clinic as well, where "agricultural, militaristic, mechanical and sports metaphors are employed to explain the disease and treatment plan" (ten Have and Gordjin 2022, p. 577) [74]. Public health discourse is loaded with metaphors, the "war" on specific diseases being most eminent. It is outside of the scope of this paper to analyze the repercussions of metaphorical landscape in healthcare. We wish to acknowledge, however, that metaphors are firstly inescapable, as a process embedded in language, a normative, meaning-making tool guiding thoughts and action.

Metaphor is how lyric thought allows us to construct meaning. Metaphor describes a likeness between different things that hinges on the "is/is not" relationship between those things. For Zwicky (2014) [62] "'x is y' is not a metaphorical claim unless 'x is not y' is true" (19). DoS teaches us that lungwort (*Lobaria pulmonaria*) can be used to treat pulmonary conditions (Crawford 2019) [29]. The lungwort lichen's thallus or body is read as a set of human lungs, and at the same time, it is not human lungs. For Zwicky (2014) [62], being is the interconnected and interpenetrating resonant ecology of things, and metaphor is how we understand that relationality. Attending to resonance, immanent to territory, is the basis for a profound relationality with the landscape and the myriad persons inhabiting place.

Perhaps part of the reason why the DoS has been overlooked and even maligned is due to the species of thinking, the epistemic attitude, that it demands. Mechanistic thinking, with its emphasis on computation and linearity, underlies western notions of progress (Haraway 2016 [63]; Zwicky 2019 [75]) and arguably yields an anemic understanding of the DoS. Metaphor, in the

broad sense, is foundational to the DoS. Metaphor is also the means by which "we experience a gestalt shift from one distinct intellectual and emotional complex to another 'in an instant of time'" (Zwicky 2003, p. 4) [76]. This gestalt shift facilitates the juxtaposition of multiple perspectives, including those that seem contradictory or in competition with one another. Zwicky draws on Wertheimer in describing a formula for Gestalt theory, which illustrates the possibility of gestalt for thinking with semiotic signs per Stjernfelt (2012) [22]: "there are wholes, the behaviors of which is not determined by their individual elements, but where the part-processes are themselves determined by the intrinsic nature of the whole" (p. 17). DoS, we suspect, has been relegated to the realm of obscure curiosity because we, in the West, are largely illiterate when it comes to reading experience through gestalt. Could the enactment of lyric philosophy through DoS help us to engage with the complexity of the world through "an ecology of experience?" (Zwicky 2014, p. 16) [62].

All "living systems are meaning-making systems" (Maran and Kull 2014, p. 41) [77], including the myriad manifestations of the plant–human assemblage. The DoS, like other relational systems that connect us with our more-than-human plant kin, calls into question the boundaries of self and yields a horizon of possibility for future ways of knowing and modes of being that could be generatively mediated by the holism integral to lyric thought.

5. Identification, Recognition, and the Future of DoS

To conclude this essay, we draw on Zwicky (2003) [76] who suggests that "those who think metaphorically are enabled to think truly because the shape of their thinking echoes the shape of the world" (foreword, paragraph 1). Embodying the affective flows (Ingold 2011) [78], the forms and patterns of the world in our lives is a way of "coming home" to ourselves (Zwicky 2014, p. 23) [62] by cultivating our "old-growth minds" in conversation with place (Sheridan and Longboat 2006, p. 366) [49]. The DoS, as a metaphoric device, not only serves as a useful heuristic for remembering and teaching people about plant medicines, but it can also act as a potent conduit to experiencing ourselves as territory and territory as ourselves.

Alexis Pauline Gumbs, self-described "marine mammal apprentice" (2020, p. 9) [79], describes the process of "identifying with". For Gumbs, identification is "that process through which we expand our empathy and the boundaries of who we are become more fluid, because we identify with the experience of someone different, maybe someone of a whole different species" (p. 8–9). "Identifying with" is a form of recognition which, according to Butler (2004) [80], is "a process that is engaged when subject and Other understand themselves to be reflected in one another" (p. 136) and through that, "the self never returns to itself free of the Other, that its 'relationality' becomes constitutive of who the self is" (p. 149). Drawing on Hegel, Butler further suggests that self-reflection is only possible through the "drama of reciprocal recognition" (p. 240) [80]. We see systems of recognition like the DoS, in its fullness, as a relational gestalt system, as inauguring a politics of the possible by creating the conditions necessary for a more holistic humanity to emerge, "identifying with", grounded in territory, and in concert with all our relations. Understanding DoS as a relational ecosemiotic system that exemplifies distributed agency and is animated by complementary sign types and the understanding that time has circular and dynamic properties serves as a starting point for the rediscovery of our embodied, emplaced, and entangled humanity.

The metaphorical aspect of western medical ontology appears to be shifting from a mechanistic towards an ecological model (Zywert 2017 [81], Baluška and Mancuso, 2007 [82]). Given that this nascent metaphorical landscape shares much with Indigenous ontologies, it may be more relevant than ever to acknowledge and respect the value of, and seek guidance from, the ways in which Indigenous people traditionally relate to their plant medicines. Recognizing the limits of the current paradigm under which we operate as human society in the West, considering alternate paths to communication and meaning-making is critically relevant. Science must once again become the story of our awareness

of, and relationship to, the animate world and that language must be understood as the body-based vehicle that refers to this animate landscape.

We envision this paper as a starting point for further research such as a fulsome ethnographic study of Indigenous interspecies communicative systems to better understand the extent to which Indigenous onto-ethico-epistemologies can complement or inform ecosemiotic theory. We are also interested in better understanding the subjective experiences of encounters with mushroom or plant persons associated with the psychedelic experience in both Indigenous and mainstream contexts. Finally, we wish that the bio-, phyto-, and ethnomedical fields will receive our contribution as an invitation to take seriously, if critically, this practice of our ancestors. The DoS and its plural manifestations, embedded in nuanced systems of coherence, have informed human relationships with plants, embracing—rather than reifying—their profound and chaotic complexities.

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References

1. Schaal, B. Plants and People: Our Shared History and Future. *Plants People Planet* **2019**, *1*, 14–19. [CrossRef]
2. Hart, B.L. The Evolution of Herbal Medicine: Behavioural Perspectives. *Anim. Behav.* **2005**, *70*, 975–989. [CrossRef]
3. Bennett, B. 2008. Doctrine of Signatures through Two Millennia. *Herbalgram* **2008**, *78*, 34–45.
4. Joshi, K.; Hankey, A.; Patwardhan, B. Traditional Phytochemistry: Identification of Drug by 'Taste'. *Evid.-Based Complement. Altern. Med.* **2007**, *4*, 145–148. [CrossRef] [PubMed]
5. Lee, T.-R. Heaven, Earth and Humans: Color Harmony in Chinese Culture. *Obuda Univ. E-Bull.* **2012**, *3*, 155–164.
6. Leonti, M.; Sticher, O.; Heinrich, M. Medicinal Plants of the Popoluca, México: Organoleptic Properties as Indigenous Selection Criteria. *J. Ethnopharmacol.* **2002**, *81*, 307–315. [CrossRef] [PubMed]
7. Kohn, E. *How Forest Think: Toward and Anthropology Beyond the Human*; University of California Press: Berkeley, CA, USA; Los Angeles, CA, USA, 2013.
8. Houle, K. Animal, Vegetable, Mineral: Ethics as Extension or Becoming? *Symposium* **2015**, *19*, 37–56. [CrossRef]
9. Maran, T. *Mimicry and Meaning: Structure and Semiotics of Biological Mimicry*; Springer: Berlin, Germany, 2017.
10. Short, T.L. *Peirce's Theory of Signs*; Cambridge University Press: Cambridge, UK, 2007.
11. Roche, S.P.; Kobos, R. Jaundice in the Adult Patient. *Am. Fam. Physician* **2004**, *69*, 299–304. [PubMed]
12. Herrick, J.W. *Iroquois Medical Botany*; Syracuse University Press: Syracuse, NY, USA, 1995.
13. Potenza, M.A.; Montagnani, M.; Santacroce, L.; Charitos, I.A.; Bottalico, L. Ancient Herbal Therapy: A Brief History of Panax Ginseng. *J. Ginseng Res.* **2023**, *47*, 359–365. [CrossRef]
14. Shi, Z.-Y.; Zeng, J.-Z.; Tsai Wong, A.S. Chemical Structures and Pharmacological Profiles of Ginseng Saponins. *Molecules* **2019**, *24*, 2443. [CrossRef] [PubMed]
15. Peirce, C.S. *The Essential Peirce: Selected Philosophical Writings*; Indiana University Press: Bloomington, IN, USA, 1992.
16. Turner, N.J.; Reid, A.J. "When the Wild Roses Bloom": Indigenous Knowledge and Environmental Change in Northwestern North America. *GeoHealth* **2022**, *6*, e2022GH000612. [CrossRef]
17. Turner, N.J. *Ancient Pathways, Ancestral Knowledge: Ethnobotany and Ecological Wisdom of Indigenous Peoples of Northwestern North America*; McGill Queens: Kingston, ON, Canada, 2014.
18. Deloria, V.; Wildcat, D. *Power and Place: Indian Education in America*; Fulcrum Publishing: Wheat Ridge, CO, USA, 2001.
19. Addessi, E.; Mancini, A.; Crescimbene, L.; Padoa-Schioppa, C.; Visalberghi, E. Preference Transitivity and Symbolic Representation in Capuchin Monkeys (*Cebus apella*). *PLoS ONE* **2008**, *3*, e2414. [CrossRef] [PubMed]
20. Cunha, J.; Rhoads, C. Use of a Tablet-Based Communication Board and Subsequent Choice and Behavioral Correspondences in a Goffin's Cockatoo (*Cacatua goffiana*). In Proceedings of the Seventh International Conference on Animal-Computer Interaction, Milton Keynes, UK, 10–12 November 2020; Association for Computing Machinery: New York, NY, USA, 2021; pp. 1–9.

21. Herman, L.M.; Kuczaj, S.A.; Holder, M.D. Responses to Anomalous Gestural Sequences by a Language-trained Dolphin: Evidence for Processing of Semantic Relations and Syntactic Information. *J. Exp. Psychol. Gen.* **1993**, *122*, 184–194. [CrossRef]
22. Stjernfelt, F. The evolution of semiotic self-control: Sign evolution as the ongoing refinement of the basic argument structure of biological metabolism. In *The Symbolic Species Evolved*; Schilhab, T., Stjernfelt, F., Deacon, T., Eds.; Springer: Dordrecht, The Netherlands, 2012; pp. 39–63.
23. Hemenway, E.A.; Gehring, M. Epigenetic Regulation During Plant Development and the Capacity for Epigenetic Memory. *Annu. Rev. Plant Biol.* **2023**, *74*, 87–109. [CrossRef] [PubMed]
24. Ponkshe, A.; Barroso, J.B.; Abramson, C.I.; Calvo, P. A Case Study of Learning in Plants: Lessons Learned from Pea Plants. *Q. J. Exp. Psychol.* **2023**, *77*, 1272–1280. [CrossRef] [PubMed]
25. Khin, M.; Cech, N.B.; Kellogg, J.J.; Caesar, L.K. Chemical Evaluation of the Effects of Storage Conditions on the Botanical Goldenseal using Marker-based and Metabolomics Approaches. *Yale J. Biol. Med.* **2020**, *93*, 265–275. [PubMed]
26. Wink, M. Evolution of Secondary Metabolites from an Ecological and Molecular Phylogenetic Perspective. *Phytochemistry* **2003**, *64*, 3–19. [CrossRef] [PubMed]
27. Sinclair, A. *COSEWIC Assessment and Status Report on the Goldenseal (Hydrastis canadensis) in Canada 2019*; Government of Canada: Ottawa, ON, Canada, 2019; Available online: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/goldenseal-2019.html#toc6 (accessed on 17 August 2023).
28. United Plant Savers. *United Plant Savers: For the Research, Education, and Conservation of Native Medicinal Plants, Fungi, and their Habitats*; UPS: Rutland, OH, USA, 2023.
29. Crawford, S.D. Lichens used in traditional medicine. In *Lichen Secondary Metabolites*; Ranković, B., Ed.; Springer: Cham, Switzerland, 2019; pp. 31–97.
30. Moermann, D.E. *Native American Ethnobotany*; Timber Press: Portland, OR, USA, 1998.
31. Turner, N.J. Learning New Medicines: Exchanging Medicinal Plant Knowledge amongst Northwestern North American Indigenous and Settler Communities. *J. Hist. Med. Med. Humanit.* **2018**, *30*, 949–976.
32. Bidartondo, M.I.; Bruns, T.D. Fine-level Mycorrhizal Specificity in the Monotropoideae (Ericaceae): Specificity for Fungal Species Groups. *Mol. Ecol.* **2002**, *11*, 557–569. [CrossRef] [PubMed]
33. Yang, S.; Pfister, D.H. *Monotropa uniflora* Plants of Eastern Massachusetts Form Mycorrhizae with a Diversity of Russulacean Fungi. *Mycol.* **2006**, *98*, 535–540. [CrossRef]
34. Turner, N.J.; Laurence, C.; Thompson, M.; Thompson, T.; York, A.Z. *Thompson Ethnobotany: Knowledge and Usage of Plants by the Thompson Indians of British Columbia*; Royal British Columbia Museum: Victoria, BC, Canada, 1990.
35. Cornelius, C. *Iroquois Corn in a Culture-based Curriculum: A Framework for Respectfully Teaching About Cultures*; State University of New York Press: Albany, NY, USA, 1999.
36. Parker, A.C. *Iroquois Uses of Maize and Other Food Plants*; Museum Bulletin No. 144; New York State Museum: Albany, NY, USA, 1910.
37. Hill, S.M. *The Clay We Are Made Of: Haudenosaunee Land Tenure on the Grand River*; University of Manitoba Press: Winnipeg, MB, Canada, 2017.
38. Holler, D.R. Fashion, Nationhood and Identity: The Textile Artistry of Caroline G. Parker. *Am. Indian Art Mag.* **2012**, *37*, 58–65.
39. Salmón, E. *Iwígara: American Indian Ethnobotanical Traditions and Science*; Timber Press: Portland, OR, USA, 2020.
40. Stevens, L.; Brewer, J. Kaʔtshatstʌ́sla: "Strength of Belief and Vision as a People"—Oneida Resilience and Corn. *J. Agric. Food Syst. Community Dev.* **2019**, *9*, 225–238. [CrossRef]
41. Webster, R.M. *Our Precious Corn*; Michigan State University Press: East Lansing, MI, USA, 2023.
42. Affifi, R. Learning Plants: Semiosis Between the Parts and the Whole. *Biosemiotics* **2013**, *6*, 547–559. [CrossRef]
43. Kull, K. An Introduction to Phytosemiotics: Semiotic Botany and Vegetative Sign Systems. Σημειωτκή-*Sign Syst. Stud.* **2000**, *8*, 326–350. [CrossRef]
44. Strait, D.S.; Weber, G.W.; Neubauer, S.; Chalk, J.; Richmond, B.; Lucas, P.W.; Spencer, M.A.; Schrein, C.; Dechow, P.C.; Ross, C.F.; et al. The Feeding Biomechanics and Dietary Ecology of *Australopithecus africanus*. *Proc. Natl. Acad. Sci. USA* **2009**, *106*, 2124–2129. [CrossRef]
45. Dong, V.; Nanchal, R.; Karvellas, C.J. Pathophysiology of Acute Liver Failure. *Nutr. Clin. Pract.* **2000**, *35*, 24–29. [CrossRef] [PubMed]
46. Efferth, T.; Greten, H.J. Doctrine of Signatures-Mystic Heritage or Outdated Relict from Middle-aged Phytotherapy. *Med. Aromat. Plants* **2016**, *5*, e177. [CrossRef]
47. Williams, K.; Brant, S. Indigenous Perspectives on the Biodigital Convergence. *AlterNative Int. J. Indig. Peoples* **2022**, *18*, 210–214. [CrossRef]
48. Barad, K. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*; Duke University Press: Durham, NC, USA, 2007.
49. Sheridan, J.; Longboat, D.R. The Haudenosaunee Imagination and the Ecology of the Sacred. *Space Cult.* **2006**, *9*, 365–381. [CrossRef]
50. Barrett, M.J.; Hinz, V.; Wijngaarden, V.; Lovrod, M. Speaking with other animals through intuitive interspecies communication: Towards cognitive and interspecies justice. In *A Research Agenda for Animal Geographies*; Hovorka, A., McCubbin, S., Van Patter, L., Eds.; Edward Elgar Publishing: Northampton, MA, USA, 2021; pp. 149–165.
51. Calvo, P.; Lawrence, N. *Planta Sapiens: Unmasking Plant Intelligence*; Hachette: London, UK, 2022.

52. Hogan, L. *The Radiant Lives of Animals*; Beacon Press: Boston, MA, USA, 2020.
53. Turner, N.; Bell, M.A.M. The Ethnobotany of the Southern Kwakiutl Indians of British Columbia. *Econ. Bot.* **1973**, *27*, 257–310. [CrossRef]
54. Antone, R. Yukwalihowanahtu Yukwanosaunee Tsiniyukwaliho:tˆ As People of the Longhouse, We Honor Our Way of Life Tekalˆ Hsalˆ Tsiniyukwaliho:tˆ Praise Our Way of Life. Ph.D. Thesis, State University of New York, Buffalo, NY, USA, 2013.
55. Johansen, B.; Mann, B. *Encyclopedia of the Haudenosaunee (Iroquois Confederacy)*; Greenwood Publishing Group: Westport, CT, USA, 2000.
56. Luna, L.E. The Concept of Plants as Teachers Among Four Mestizo Shamans of Iquitos, Northeastern Peru. *J. Ethnopharmacol.* **1984**, *11*, 135–156. [CrossRef] [PubMed]
57. Luna, L.E. Icaros: Magic melodies among the mestizo shamans of the Peruvian Amazon. In *Portals of Power: Shamanism in South America*; Langdon, J.E., Baer, G., Eds.; University of New Mexico Press: Albuquerque, NM, USA, 1992; pp. 231–253.
58. Guzmán, G. Hallucinogenic Mushrooms in Mexico: An Overview. *Econ. Bot.* **2008**, *62*, 404–412. [CrossRef]
59. Sabina, M. *María Sabina: Selections*; University of California Press: Berkeley, CA, USA; Los Angeles, CA, USA, 2003.
60. Simard, S. *Finding the Mother Tree: Uncovering the Wisdom and Intelligence of the Forest*; Penguin: London, UK, 2021.
61. Oyserman, D.; Coon, H.; Kemmelmeier, M. Rethinking Individualism and Collectivism: Evaluation of Theoretical Assumptions and Meta-analyses. *Psychol. Bull.* **2002**, *128*, 3–72. [CrossRef] [PubMed]
62. Zwicky, J. What is lyric philosophy? *Common Knowl.* **2014**, *20*, 14–27. [CrossRef]
63. Haraway, D.J. *Staying with the Trouble: Making Kin in the Chthulucene*; Duke University Press: Durham, NC, USA, 2016.
64. Zwicky, J. *Lyric Philosophy*; Gaspereau Press: Kentville, NS, Canada, 2011.
65. Heiti, W. What is Lyric Philosophy? *Philos. Lit.* **2015**, *39*, 188–201.
66. MacLean, H. *The Shaman's Mirror: Visionary Art of the Huichol*; University of Texas Press: Austin, TX, USA, 2012.
67. Myerhoff, B. The Deer-Maize-Peyote Complex among the Huichol Indians of Mexico. Ph.D. Thesis, University of New Mexico, Albuquerque, NM, USA, 1968.
68. Myerhoff, B. The Deer-Maize-Peyote Symbol Complex Among the Huichol Indians of Mexico. *Anthropol. Q.* **1970**, *43*, 64–78. [CrossRef]
69. Fikes, J.C. Huichol Indian Identity and Adaptation. Doctoral Dissertation, University of Michigan, Anne Arbor, MI, USA, 1985.
70. Haraway, D.J. *The Companion Species Manifesto: Dogs, People, and Significant Otherness*; Prickly Paradigm Press: Chicago, IL, USA, 2003.
71. Viveiros De Castro, E. Cosmological Deixis and Amerindian Perspectivism. *J. R. Anthropol. Inst.* **1998**, *4*, 469–488. [CrossRef]
72. Sexton, A.; James, P.A. Metaphors and Why these are Important in all Aspects of Genetic Counseling. *J. Genet. Couns.* **2022**, *31*, 34–40. [CrossRef] [PubMed]
73. Neilson, S. Pain as Metaphor: Metaphor and Medicine. *Med. Humanit.* **2015**, *42*, 3–10. [CrossRef] [PubMed]
74. Ten Have, H.; Gordijn, B. Metaphors in Medicine. *Med. Health Care Philos.* **2022**, *25*, 577–578. [CrossRef]
75. Zwicky, J. *The Experience of Meaning*; McGill-Queen's Press: Kingston, ON, Canada, 2019.
76. Zwicky, J. *Wisdom & Metaphor*; Gaspereau Press: Kentville, NS, Canada, 2003.
77. Maran, T.; Kull, K. Ecosemiotics: Main Principles and Current Developments. *Geogr. Ann. Ser. B Hum. Geogr.* **2014**, *96*, 41–50. [CrossRef]
78. Ingold, T. *Being Alive: Essays on Movement, Knowledge and Description*; Routledge: London, UK; New York, NY, USA, 2021.
79. Gumbs, A.P. *Undrowned: Black Feminist Lessons from Marine Mammals*; AK Press: Chico, CA, USA, 2020.
80. Butler, J. *Undoing Gender*; Routledge: London, UK; New York, NY, USA, 2004.
81. Zywert, K. Human Health and Social-ecological Systems Change: Rethinking health in the Anthropocene. *Anthr. Rev.* **2017**, *4*, 216–238. [CrossRef]
82. Baluška, F.; Mancuso, S. Plant Neurobiology as a Paradigm Shift not only in the Plant Sciences. *Plant Signal. Behav.* **2007**, *2*, 205–207. [CrossRef] [PubMed]

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