

Toxicity and Plant Animacy in Amazonia: Cosmology, Chemosensation, and Ecosemiotics

Lewis Daly¹ and Glenn H. Shepard Jr.²

Abstract:

In Indigenous Amazonian life-worlds, plants used for diverse purposes such as protecting, harming, seducing, and curing are sometimes considered to be ‘plant persons’, imbued with special kinds of subjectivity. In examining plant animism in Amazonia, we consider case studies of the knowledge and use of toxic, medicinal and charm plants from two distinctive societies: the Makushi people of Guyana (Daly) and the Matsigenka of Peru (Shepard). We have focused on the chemosensory modes of communication (taste, odour, texture, etc.) that shape Makushi and Matsigenka interactions with plants, with a particular emphasis on bitterness, causticity, and other toxic properties that often embody a plant’s power to heal or harm. Here, we delve deeper into Makushi understandings and uses of shamanic plants within the category of *bina* ‘charms’, exploring how their animacy is entangled with chemosensory properties, phytochemical components and modes of preparation and administration. We also revisit Matsigenka knowledge, concepts, and uses of various bamboo species, revealing a complex interpenetration between tactile and chemical perceptions, phenological cycles, and eco-cosmological elaborations. Using these cross-cultural examples, we show how plant animacy can be expressed through sensorial and ecosemiotic processes of embodiment and ensoulment which defy Cartesian mind/body, nature/culture, and subject/object dualisms, requiring a deeper engagement between anthropology and the natural sciences. Indigenous perspectives on plant animacy raise far-reaching questions about the meanings of body, soul, and nonhuman agency in Indigenous Amazonia, contributing to the relevance of anthropology and ethnobiology in the critical context of the Anthropocene.

Keywords: Amazonia, ethnobotany, animism, plants, toxicity, sensory ecology

Introduction: “Plants are people”

Visiting the Makushi village of Yupukari in southern Guyana last spring, my friend and long-term research interlocutor Diane turned to me,³ pensively, and said, “Krambie,” (my Makushi nickname, after a folk-variety of cassava),⁴ “*I believe in plants!*” Her tone was

¹ Department of Anthropology, University College London (UCL), UK. l.daly@ucl.ac.uk

² Department of Anthropology, Museu Paraense Emílio Goeldi (MPEG), Belém, Brazil. gshepardjr@gmail.com

³ Note: All names are pseudonyms.

⁴ I was named after a variety of cassava (*kîse*) called *karan pi pi’ye* which I’d brought to Yupukari from Rewa, another Makushi village, in 2013. It is common practice for cassava varieties to be named after people (this

thoughtful yet defiant—as if this were a political assertion of deep importance. Diane is a young Makushi mother who has worked in local ecotourism for several years, and has a keen interest in gardening and horticulture. She had just returned from Lethem, the border town with Brazil, where she had collected a variety of seedlings and cuttings from friends and relatives living there. These were mainly ornamental plants for the flower beds around her house (*Hibiscus*, *Bougainvillea*, the succulent *Kalanchoe*, cacti, and others). Some also belonged to a large and diverse category of charm plants (*muran*), known by the general term *bina* in Guyana (a word derived from the Arawak), which are used for protection (as well as many other purposes): they are “guard dogs”, in Diane’s words.

“*Bina* plants are people,” she told me. “They are charms (*muran yamî*). They can protect you, like a guardian. Or they can kill you...”

Santiago, Diane’s nephew, interjected, “You’ve got to talk to those plants, you know!”

Diane concurred, before continuing, “The *binas* speak back in dreams. Their spirits whistle... Plants, they have a spirit (*ekaton*): a personality, you could say, they can get angry, or sad. Their spirit takes a human form. In dreams, sometimes the plants come to their owner as little people, short people, they say.”

Santiago added: “You have to feed the plant. You water it, but you can also give it banana skin, fruit skin, even meat, blood, things like this. *Bina* really is a relationship, two-way. With crops, you take care of them in the garden, but a *bina* plant can take care of you, if you take care of it.”

What does it mean when a research collaborator tells us that a plant is a person, and that it can communicate with humans? How are we to interpret and understand such a statement, which seems to extend beyond anthropocentric Western notions of personhood, or scientific understandings of the botanical realm? What do notions such as soul, spirit, and life itself mean in such different cosmological contexts? As a starting point, our anthropological training teaches us to avoid naturalistic, reductionist, and ethnocentric interpretations, taking the explanations of our interlocutors and research collaborators seriously. And yet co-author Glenn Shepard and I have also argued that part of this process of ‘taking seriously’ is to go beyond the confines of ethnographic case studies and anthropological theory. Both our Makushi and Matsigenka interlocutors, respectively, know far more about plants, and their

cultivar has been playfully re-named ‘Lewis stick’, *lewis pîye*, in Yupukari), but a special privilege, in this case, for the human also to be named after the cassava in return.

intrinsic perceptual and chemical properties and ecological associations, than we. By examining the available botanical, phytochemical, and ecological literature, we have encountered intriguing synergies with Makushi and Matsigenka uses and understandings of plants, which might otherwise appear to have an arbitrary or symbolic basis (Daly & Shepard, 2019).

Such overlapping of different perspectives and kinds of knowledge results in what we have called a ‘parallax view’ of human-plant interactions, revealing unexpected details, depths, and richness (Shepard & Daly, 2023).⁵ By paying special attention to the chemosensory domain of Indigenous knowledge about plants and other ecological phenomena, we have developed a phytochemically informed, shamanically-inspired ethnobotany with relevance for the emerging fields of ecosemiotics and plant intelligence (Shepard, 2018; Shepard & Daly, 2021). We have elaborated the paradigm of ‘sensory ecology’ (Shepard, 2004), and the associated method of ‘phytoethnography’ (Daly & Shepard, 2019) as an approach to Indigenous plant knowledge that brings the disparate domains of ethnopharmacology, historical ecology, ontological anthropology, and multispecies ethnography into a multifaceted, and, we hope, productive dialog. Animism is an orientation which is highly attuned to the dynamics, logics, and interactions of the living world. As such, an ethnobiological lens can lend a crucial perspective to complement the more theoretical currents from anthropology and philosophy. While wary of accusations of biophilia (e.g., Descola’s critique of Kohn, 2014) or neo-vitalism (e.g., Duarte, 2021, on Ingold), we hope that these explorations help to valorise Indigenous ecological knowledge, as well as our botanical interlocutors themselves, by taking seriously these other-than-human logics of life. Rather than ‘reducing’ Indigenous knowledge down to scientific explanations, we seek an approach that is ‘additionalist’, bringing different knowledge frames into symmetrical dialog (Daly & Shepard, 2019). Our work also highlights the importance of deeply immersive ethnography in conjunction with engaged ethnobiological research in intense long-term collaboration with local communities.

Plant Animism in Amazonia

A great deal has been written on animism in anthropology since its renaissance as a theoretical concept in the 1990s, including a portfolio of work which has influenced, inspired,

⁵ Our use of the term ‘parallax view’ was inspired by Ginsberg’s (1995) analysis of Indigenous media; however, Žižek’s (2006) more recent formulation is also relevant.

and frustrated us in equal measure (cf. Bird-David, 1999; see also Costa & Fausto, 2010, for a helpful review on Amazonia). At its most basic, animism represents an attempt to capture the causal logic and ontological moorings of cosmological systems in which vitality, agency, and sentience are attributed to many, if not all, of the interconnected elements, objects and beings that make up the universe. Owing in part to its problematic history as a thought system attributed to ‘primitive’ peoples in early evolutionist anthropology—first, and most famously, by Tylor (1871), but also by later scholars such as Levy-Bruhl (1910)—it is often difficult to write about animism in contemporary Amazonia without raising romanticising, exoticising, and orientalisising tropes (Ramos, 2003).

In contemporary theory and practice, animism increasingly entails an *ethical orientation* to the world, emphasising respect for nonhuman beings and life in general (Harvey, 2006; see also Kohn, 2022). David Abram’s (2010) magic-inspired ‘earthly cosmology’ is one example of what has been called the New Animism. The revitalisation of animism as an ethical, lived practice has gained heightened salience with the growing urgency of the planetary environmental crisis in the Anthropocene. Or, as Marisol de la Cadena (2015, p. 3) has ironically labelled it with reference to Indigenous societies across Latin America, the ‘anthropo-not-seen’: “The anthropo-not-seen was, and continues to be, a war waged against world-making practices that ignore the separation of entities into nature and culture—and the resistance to that war.” It is in this context that we advance a critical, sensory ecological approach to animated life-worlds in today’s globalised and out-of-balance world.

Animism has inspired some of the most theoretically innovative lines of thinking in anthropology since the 1990s, most notably Descola’s theorisation of animism as an ontological mode of praxis (2013) and Viveiros de Castro’s pan-Amazonian model of Amerindian perspectivism (1998). These important pillars of contemporary anthropological theory have taken Amazonian philosophies of life as a starting point for retheorising anthropology itself in an Indigenous frame. Drawing on earlier work by Hallowell (1960) among the Ojibwa (Ojibwe) people of Ontario—in particular, his influential concept of ‘other-than-human persons’—Amazonian anthropologists have explored the plural and variegated forms that nonhuman personhood and subjectivity can take in Indigenous ontologies.

As Rival (2012b, p. 128) has noted, in animist worlds, there are no ‘things’: some-‘thing’ is always really ‘some-one.’ Moving well beyond Tylor’s evolutionist rendering of animism as “the most primitive form of religion” (1872), contemporary scholars have

documented, analysed, and valorised the complexity, coherence, and moral imperative found in animist life-worlds in contexts as diverse as Amazonia (Descola, 1994), Siberia (Willerslev, 2007), Southeast Asia (Århem, 2016), and India (Bird-David, 1999). Whether conceived of as a ‘relational epistemology’ (Bird-David, 1999), an ‘eco-cosmology’ (Århem, 1996), or a ‘perspectival ontology’ (Viveiros de Castro, 1998), anthropologists have celebrated animism as a theoretical paradigm with profound philosophical implications. Indeed, Willerslev (2012) has quipped that theorists may even take animism too seriously: for his Siberian interlocutors, animism is a more jovial affair, since spirits are beings that are regularly laughed about.

Animism entails a particular ontological logic towards life itself (Descola, 2013; see also Medeiros Prado et al., 2022). As Rival (2012b) and Praet (2014) have observed, animism tessellates with life, but also with notions of soul and spirit (Rivière, 1999). In this sense, animism represents an ontological system in which the categories of biological life, on the one hand, and religion or spirituality, on the other, overlap and shade into one another. Animism is ultimately about relations between diverse beings that remain fundamentally unstable: a fluid, integrated, relational system in which all beings, things, and forces are embroiled in a “single field of relationships” (Ingold 2000, p. 75). Thus, Western ontological categories of existence, often binary (human/nonhuman, subject/object, organic/inorganic, alive/dead etc.), lose their relevance. Animist life-worlds tend to be monistic and defiantly anti-dualist in character and composition. And yet, academic theorisations of animism have often relied on abstract philosophical constructs that are severed from the vibrant, pulsing, stinking biology of the lived world, and which thus—contrary to their explicit intention—tend implicitly to reinforce deeply imbedded Western philosophical tenets such as the nature/culture dualism (see Shepard, 2019; Shepard & Daly, 2021). In this regard, Ingold’s rejection of the reified concept of animism (2006) and his critical dissection of post-structuralist theories of ontology (e.g., Ingold, 2016, for his critique of Descola) are especially instructive. Animism, as we see it, is not merely a way of perceiving and knowing the environment; it is also a way of relating to and reinventing it. Rather than a static structural or ontological mode, animism is equally, and also, a way of worlding; a political orientation driven by a creative impulse and spirit of resistance in engaging alterity, a point which has taken on added salience in the critical context of the Anthropocene.

In its etymological origin, animism is derived from the Latin term *animus* (pl. *anima*), ‘breath’, the same root found in the modern word ‘animal’ (*animalis*, ‘having breath’). Indeed, the association between living beings and the respiratory faculty is reflected in many

Indigenous cosmologies, which associate spirit with breath (e.g., Salmón, 2000, on the Rarámuri). To fully express this breath-like quality, one might eschew the noun form of ‘animism’ in favour of verbal adjectives like ‘animated’ emphasizing the active, processual essence of animated liveliness which characterises many Indigenous life-worlds. We propose the alternative term ‘animacy’, suggesting a grammatical gradation of sentience or liveliness, which perhaps better captures the variegated field of agency that permeates animist life-worlds. This concept also draws our attention to the complex and sophisticated linguistics underscoring animist concepts and principles in different languages. In this article, we hope to explore and compare diverse ontological variations on animism by emphasising local concepts and theories about agency, vitality, and the biological dimensions of the life-worlds. This exercise certainly requires close attention to human languages, linguistics, and grammars. Indeed, in his original formulation of ‘cosmological deixis’ in Amerindian perspectivism, Viveiros de Castro (1998)—drawing on the work of Århem (1996) and Stolze Lima (1999)—emphasized language as a window into ontological grammar.

Additionally, we argue that a true appreciation of animacy with regard to Amazonian plant worlds must also pay attention to the unique and distinctly non-human grammars of phytochemical-driven plant biosemiotics (Shepard, 2018; Daly & Shepard, 2019; Shepard & Daly, 2021). In the ‘highly transformational world’ of Indigenous Amazonia (Rivière, 1994), not all nonhumans are the same kinds of subjects, and not all subjects are the same kind of subjects, all of the time. The vitality of non-human life-forms in Amazonia cannot be universalised; rather, ‘other-than-human persons’ (again, following Hallowell, 1960), like megadiverse Amazonian forests, are dynamic, heterogeneous, and characterised by multiplicity of form. Whereas souls, spirits, and nonhuman personhood have been of great interest to ontologically minded anthropologists for some time (e.g., Viveiros de Castro, 2007), life in its more biological and ecological elements has typically been relegated to the subfield of ethnobiology (e.g., Posey, 1984). Moreover, anthropological interest in Amazonian animism was long focused on the mythical and shamanic significations of human-animal interactions, notably predation, with relatively less attention paid to plants (Rival, 2012a), at least until quite recently (Daly 2015a; de Oliveira, 2016; Miller, 2019; Daly & Shepard, 2019). Thus, in our previous work, we have asked the questions ‘What kind of people are plants?’ (Daly 2015b; Daly and Shepard 2019) and ‘What kind of plants are people?’ (Shepard and Daly 2022), in order to open up the field of animist conversation to include plant personhood in Amazonia.

Even in recent multispecies ethnographies in Amazonia such as those by Oliveira (2016), Maizza (2017), and Miller (2019), where plants have been an explicit subject of investigation, the focus has tended to be on notions of kinship, love, and caring towards cultivated crop species. While these are clearly important elements of human-plant interactions, an almost exclusive focus on cultivated crops, on the one hand, and on anthropocentric notions of kinship and emotion, on the other, overlook the distinctive, and decidedly other-than-human forms of plant communication, reproduction, and intelligence. By contrast, we have focused our work on Indigenous peoples' uses of sense perceptions, and especially the chemical senses of taste, odour, and detection of irritants, to interact with plant-derived substances. Though Miller (2019) proposes a 'sensory ethnobotany', she mostly ignores the chemical senses, not to mention the existing body of work on anthropologically- and ethnobotanically-oriented sensory ecology that predates her work by two decades (Shepard, 1999, 2004, 2015, 2018). If we are to take plant interlocutors seriously, we must engage with the singular modalities of plant communication and intelligence (Shepard, 2018; Shepard & Daly, 2021) while seeking a more botanically informed understanding about plants' strategies around reproduction, community, and competition.

This paper draws on previously published research done independently by Daly and Shepard among two distinctive, linguistically unrelated and geographically separated indigenous peoples, the Carib-speaking Makushi people of the North Rupununi region of southwestern Guyana, and the Arawak-speaking Matsigenka of Manu Biosphere Reserve in southern Peru. As described in more detail in Daly and Shepard (2019), the two only began working together and comparing their results in 2018, after major field research was completed and several articles had been published. This paper aims to further develop these comparative discussions by focusing on two groups of plants mentioned in prior collaborative papers: the *bina* charm plants used by the Makushi and other peoples of the Guianas (Daly and Shepard 2019; Shepard and Daly 2023), and *Guadua* and other bamboos that figure prominently in the ethnobotany of the Matsigenka (Shepard and Daly 2022).

***Bina*: Makushi Plant-Charms**

Returning to the *bina* plant-charms from the introductory vignette, we can start to explore how Indigenous concepts and practices foreground powerful plants in the fabrication and maintenance of human persons and social relations. Doing so requires a rendering which moves beyond merely symbolic or anthropocentric explanations of plant animacy. For the

Carib-speaking Makushi people of southern Guyana and northern Brazil, plant-charms constitute an important facet of both everyday and ritual life. Makushi life, livelihood, economy, and cosmology is unthinkable without plants: expert horticulturalists, Makushi people practice small-scale swidden farming in the rainforest, and, even by Amazonian standards, cultivate a truly staggering diversity of plants (see Daly, 2015a, 2021). As well as cultivating plants in this impressive agricultural complex, Makushi people (in particular, local healers and shamans) also gather a wide range of wild and semi-domesticated plants from the forest (*yu'*) and savannah (*etei*) for the purposes of healing and ritual usage.

The most important and well-known category of ritual plant among the Makushi, as well as the neighbouring Indigenous peoples of Guyana, is *bina*.⁶ The category of *bina* plants is incredibly broad and diverse: it contains cultivated and wild species, and spans a diversity of plants families and genera, from Araceae (arums) and Hippeastrum (amaryllis) to grasses, sedges, cacti, and succulents. During my long-term ethnobotanical work with several Makushi communities since 2011, we have recorded somewhere in the region of 200 different named folk-varieties of *bina* charm (Daly, 2015a, p. 233-266; also Van Andel et al., 2015 for our cross-cultural survey of plant-charms in the Guianas).⁷ Cultivated species of *bina* may be grown in the farm (*mũ*), the kitchen garden (*umĩ*), or around the homestead. It is common to see these plant charms growing in plastic buckets or old paint cans hanging from beams around the house or placed in unassuming locations around the yard.⁸

Bina plants were often called ‘attracting charms’ in the early ethnological and ethnobotanical literature (e.g., Roth, 1915; Fanshawe 1949)—and quite often, they do serve to attract some-*thing* (money, knowledge, prestige) or some-*one* (a game animal, fish, or love interest) towards the user of the charm. More specifically, the charms are used to enhance a particular capacity or propensity in the user. For example, hunting charms make their user more accurate a marksman with their bow and arrow; knowledge charms make their user sharper of mind and a swifter learner (e.g., for use in school, or if learning a new language);

⁶ *Bina* is a generalised term, derived from the Arawak, used cross-culturally among the indigenous groups of Guyana. The equivalent Makushi (Carib) term is *muran*, which translates roughly as ‘charm’ (see Daly, 2015a, Chapter 6, for an extended discussion and historical review).

⁷ In this study, we recorded 366 plant-charms, representing 145 species, among 11 different ethnic groups across the Guianas (Van Andel et al., 2015, p. 1). See also important ethnographic work by colleagues including Cooper (2015), Whitaker (2016), Tamboli (2023), and Lewy (2023), who have all described *bina* plants in contexts across the Guianas. See also Whitaker et al. in this special issue for a comparative study of plant charms used in shamanism and sorcery across the Guianas.

⁸ Cooper reports that certain types of *bina* charm can be grown by killing a boa constrictor (*aman*) or osprey (*tanuaka*) before burning it to see which plants emerge. Once the new plants grow, each can be picked and used as a *bina* charm, guide, or companion (see Cooper 2015: 158-159).

romantic love charms make their user more handsome and attractive to the object of their affections. Perhaps the most well-known *bina*s are species of *Caladium* (arrow-leaf or ‘heart of Jesus’), which are specialist hunting charms. Each variety corresponds to a particular game animal, whereby the coloured patterns on the leaves resemble or otherwise signify the game animal in some way. For example, the red brocket deer *bina* (*Caladium bicolor*; *usari murani*) has vivid red patterns on the surface of its large, arrow-shaped leaves. Likewise, a variety with mottled white leaves is a charm for the white-tailed savannah deer (*waikin murani*). Some *bina* plants exhibit a stronger, more dangerous kind of power (*merunfi*) than everyday charms—these are those secret plants that are used by shamans and sorcerers in the business of the soul, and with matters relating to life and death (healing, cursing, killing, and so on). In the wrong hands, or with the wrong kind of intentionality, these shamanic plant-charms are highly dangerous and are feared by most people (see below).

Despite its botanical diversity, one feature which seems to pervade the category of *bina* is the presence of large, fleshy storage organs such as bulbs, rhizomes, tubers, and swollen stems. A common theme in the *bina* charming complex is the transfer of bodily substances between the human user and plant-charm. Typically, *bina* plants have bulbs, often with a musky or pungent fragrance. Others may have an intensely bitter taste. Many species also have toxic, noxious, irritating, or astringent properties. The bulb (or rhizome, fleshy stem, leaf etc.) is usually integral to the application of the charm—it may be rubbed into the skin of the user, or its juice may be dripped into an orifice (eye, ear, nose etc.—usually the seat of a particular sense). Traditionally, small cuts would be made on the skin into which the juice of the plant would be rubbed, usually on those body parts corresponding to the efficacy of the charm (e.g., hunting charms would be applied to the forefinger and thumb, as well as the arms and shoulders—the body parts used in the firing of arrows from a bow). Some particularly powerful *bina* plants can also be applied by inserting them into the rectum, which, according to some, is the most effective way to harness—and embody—their power.⁹

We have previously written about the toxic and noxious properties of shamanic plants in Amazonia (see Daly & Shepard, 2019). Many *bina* species contain potent phytochemicals and alkaloids, including, prominently, crystals of calcium oxalate known as raphides. Raphides can create swelling and inflammation in animal tissue through a process which has been termed the ‘needle effect’ (Konno et al., 2014). These microscopic needles puncture

⁹ The rectum is also associated with the assault sorcery of the *kanaimà*. For a more targeted discussion of this, please see Whitaker et al. (this issue), Butt Colson (2001), and Whitehead (2002).

flesh, creating holes in membranes to facilitate the flow of other toxic phytochemicals into the flesh of the herbivore. In low concentrations, raphides can create an astringent effect (e.g., in pineapple or kiwi fruit), but in higher concentrations, they can induce severe inflammation and swelling. Widespread **bina** genera such as *Dieffenbachia* sp., *Hippeastrum* sp., and *Xanthosoma* sp. all contain high concentrations of raphides (*Dieffenbachia*, for example, is known as the most toxic genus in the Araceae family, owing to the presence of raphides). All are known locally for their pronounced toxicity, a quality which comes to the fore in the practice of transferring bodily substance from plant to human in the application of the charm. In the case of *Hippeastrum*, it is no accident that the bulb is used in the application of the charm: this is the most toxic part of the plant, containing a condensation of toxic phytochemicals including lycorine which can cause nausea, vomiting, and diarrhoea in humans if ingested (Andrade et al., 2012).

Overall, the sensory ecology of **bina** plants centres on the potency of toxic, poisonous, and noxious substances contained within the organs and tissues of the plants themselves. There are also non-vegetal **bina** charms, including stinging insects and arthropods such as ants, wasps, scorpions, and spiders. Underscoring the role of poison, venom, and toxins in Makushi shamanism and ontology, these tend to be species with particularly potent venom and stings, such as the bullet ant (*uyu'*) (*Paraponera clavata*), which is regarded as having the most painful sting in the world. Moving beyond simplistic material/immaterial or subject/object dualisms, the subjective agency—or 'personhood'—of these plants tends to be entangled with their toxic potency in vernacular explanations and accounts. Thus, we see a deep-seated and fluid entanglement of substance and spirit, of body and soul, which is consistent with theorisations of embodiment and person-making across Indigenous Amazonia (e.g., Santos-Granero 2012).

Bina plants are routinely described as little 'persons' or 'people' (*pemon*; *pemon'kon*) with animating souls (*ekaton*). They have qualities of personhood such as sentience, volition, and intentionality, as well as the ability to communicate (often via the medium of dreams, *we'ne*). What tends to come to the fore is their multi-sensorial agency: like humans, they can see, hear, speak, even smell and taste (as evidenced by the practice of burning incense around one's plants to keep them 'happy' (*atausinpa*), or feeding them blood, meat, or food scraps, as well as alcohol and tobacco). Put differently, in Makushi cosmological exegesis, the ability to sense is an integral expression of personhood as a trans-specific capacity. Their ability to sense, in turn, undergirds the emotional constitution of the plants: they are often described as being happy, angry, or sad, making these emotions known

to their owners through dream-communication. For instance, Harold, a local carpenter and ecotourism guide, described how *bina* plants appear in dreams (*we'ne*) “like little people made of light” in order to communicate important messages to their owners. *Bina* charms (especially those used for protection or guardianship) are often cultivated in kitchen gardens next to the homestead, or in buckets or old paint cans hung from the eaves of houses. It is common to see these plants growing amongst food crops and medicines in the garden. Of one such example, a *Hippeastrum* sp. called *emkusîma*, Makushi elder Elspeth told me, “It keeps away evil spirits (*katon'pî*) and stops people from cursing me.” Owners will often leave food for the *bina* plants (fruit, bones, meat, tobacco, alcohol), and may also speak or sing to them, to keep them ‘happy’ and to prevent them from becoming too ‘wild’ (that is, they must be ‘tamed’, *eranmara*). Wildness is often cited as the cause of *binas* becoming uncontrolled and dangerous, a perilous state whereupon they can harm or even kill people outside of the intentionality of their owner. As Harold warned me, “If the plant eats blood (*mîn*), it grows big, powerful, but also hard to control... They can start killing people. But if you don’t feed them, they get hungry (*emi'ne*)—they can start killing people now.”

Crucially, *bina* plants are neither inherently good or bad: they are ambiguous beings who can be used for a great diversity of reasons and purposes, and, in a sense, reflect the moral intentionality of their user. They can be used to heal, but also to harm or for vengeance. They can help provide food for one’s family (e.g., hunting and fishing charms), but also to become a much-feared *kanaimà* (homicidal ‘assault sorcerer’—see below). However, these plant-charms are not merely subsidiaries of their human owners: they also have the power to alter or influence the volition of their users in fundamental ways. If these powerful plants end up in the wrong hands, their power may be too much for the novice to handle, leading to unintended—and potentially catastrophic—consequences. Only shamans (*pia'san*), the ritual specialists in trans-specific communication and transformation, are really able to control the unruly agency of the most powerful and dangerous *bina* plants. The *pia'san* has been variously described by my interlocutors as “the original spiritual warrior” and “the master of plants”: “the plants”, as I was told, “are his arsenal”. As well as the *pia'san*, these powerful plant-charms are used by *kanaimà*, much-feared practitioners of homicide and necromancy, who have sometimes been called ‘dark shamans’ (Whitehead, 2002) or ‘assault sorcerers’ (Wilbert, 2004) in the literature (see Whitaker et al., this issue, for a pan-Guianese overview).

Without wishing to advance a reductive biochemical explanation for plant animism (quite the contrary), there is nevertheless a distinctive logic at play in the *bina* charming complex, which centres around the intermingling of substance, sensation, and spirit.

Following the vernacular explanations of Makushi interlocutors such as Diane and Harold, we suggest that toxic phytochemicals such as raphides and other potent plant substances may have a central role in structuring concepts of witchcraft and sorcery, including *kanaimà* necromancy among the Makushi and other peoples of the Guianas (see Daly and Shepard 2019 for a more detailed discussion). The idea of human-plant substantial and sensorial interpenetration resonates with theorisations of embodiment, consubstantiality, and people-making by many Amazonianist ethnographers (e.g., Seeger, Da Matta, & Viveiros de Castro, 1979; Conklin, 1996; McCallum, 1996; Vilaça, 2005; Zent, 2005; Barreto, 2022). Although plants such as *bina* are central to the fabrication and destruction of bodies in this Indigenous schema of embodiment and personhood, they have rarely been described in the ethnographic literature.

Bamboos in Matsigenka Ethnobotany and Eco-Cosmology

The Matsigenka are an Indigenous people numbering some 13,000 in southern Peru who speak an Arawakan language closely related to Ashaninka. Previous research has highlighted the fundamental role of sensory evaluation, particularly taste, odour, and chemical/physical irritation, in shaping Matsigenka herbalists' identification, selection, use and understandings of plant medicines (Shepard, 1999, 2004). The Matsigenka place a special importance on bitter, toxic, caustic, and other noxious plants in both their medical ethnobotany and their shamanic practices (Shepard, 1998, 2004). Moreover, Matsigenka understandings of plant animacy are also closely tied to such chemosensory evaluations of toxicity, as epitomized in the term *kepigari*, literally "that which intoxicates," used equally to describe giddy illnesses, lethal poisons, psychoactive plants, and shamanic states of trance (Shepard, 1998, 2019).

The Matsigenka language contains an explicit grammatical category for animate vs. inanimate beings, marked by a pair of suffixes to nouns and verbs: *-n-* for the animate category and *-t-* for the inanimate category (Shepard, 1997; Shepard & Daly, 2021). Curiously, the Matsigenka generally do *not* consider plants to be 'animate' beings. Although plants are alive, and contain a 'life essence' (*ani*), they do not have the capacity for willful locomotion, and hence are mostly considered 'inanimate' (Shepard, 2019). Animals as well as celestial bodies and other active beings show willful motion and agency, and hence are considered 'animate' and possessing of a soul (*suretsi*). The soul for the Matsigenka is not a disembodied spiritual vapor relegated to the pineal gland: it is a concrete entity that takes the

form of a human-like body, invisible in ordinary interactions, but which reveals itself in dreams and shamanic visions. Certain plants, however, do possess such souls or ‘spirit owners’ (*itinkami*), notably psychoactive plants like tobacco, ayahuasca, and others. Curiously, plants with free-flowing latex like rubber and the highly caustic *Hura crepitans* are also said to belong to the category of ‘animate’ beings because of their freely running sap, the elastic nature of their dried resin and, in the case of *Hura*, their caustic properties, which can heal or cause harm, depending on usage.

As described in greater detail in Shepard and Daly (2021), some Matsigenka hunters also include certain sharp, physically irritating bamboo species in the category of animate ‘plant-persons’. The bamboo species *Guadua weberbaueri*, known as **kapiro** in Matsigenka, is used to make razor-sharp points for the arrows used for hunting. Bamboo is said to contain a form of poison (*kepigari*) that causes profuse bleeding when an arrow strikes an animal, or a person for that matter. A second, related species of bamboo, known as **shinkerokota** in Matsigenka (possibly *Guadua sarcocarpa*), is said to have an even more powerful, haemorrhage-inducing ‘poison’. The Matsigenka are no strangers to the painful and potentially lethal power of bamboo-tipped arrow points. Through 1985, communities of the Manu and upper Camisea were subject to occasional attacks by the isolated Yora or Nahua people, and many on both sides were killed or wounded by arrows during those conflicts (Shepard et al., 2010). In addition to the sharp edges of its broken or sharpened stems, **kapiro** is covered in sharp spines and urticating hairs, which can produce severe itching.

The presence of such noxious physical and chemical properties seems to be involved in Matsigenka conceptions about bamboo and other toxic plants as “animate” and possessing agency and a human-like soul. Due to this “toxic animacy” of bamboo, a Matsigenka man is prohibited from making arrows or handling bamboo during his wife’s pregnancy. The ‘painful’ (*katsi*) and ‘urticating’ (*kaeni*) properties of this powerful species can damage the unborn foetus, leading to bleeding or spontaneous abortion. As the elder Romulo described (see Shepard & Daly, 2021, p. 84) “**Kapiro** is painful... We use it to make arrows. It really hurts. And if we carve arrow points when our wife is pregnant, the soul of the plant will take revenge and cut the umbilical cord before it is born, and she will lose the baby.”

The Matsigenka have a deep knowledge of the ecology and taxonomy of multiple bamboo species, including the genus *Guadua*. They recognize six folk taxa of bamboos within the scientific genus *Guadua*, some of which were poorly understood by botanists until recently (Shepard et al., 2001). Bamboos, including the main *Guadua* species mentioned here, play a prominent role in the Matsigenka myth of the origins of biodiversity, in which

the original trickster-shaman Yavireri uses his transformative breath to turn primordial humans into a wide variety of animal species. Throughout various episodes of the story, Yavireri's transformative powers also give rise to numerous culturally important plant species including maize, peach palm (*Bactris gasipaes*), Peruvian balsam (*Myroxylon*), and a series of multiple bamboo species, in order, from larger to smaller sizes. Certain bamboo species are good indicators of soil type and disturbance regimes, making them figure prominently in Matsigenka ethnoecological classification of forest habitats (Shepard et al., 2001), which includes at least six bamboo-dominated forest types. At the same time, this sophisticated ecological and taxonomic knowledge also shapes certain myths, cosmological conceptions, and spiritual beliefs. **Kapiro** bamboo (*G. weberbaueri*), the main species used by the Matsigenka to manufacture arrow points, is also an indicator of past human-caused disturbances. *Guadua* bamboo stands are an especially important aspect of forest ecology in the southwest Amazon (McMichael et al., 2013). Intense or repeated occupation over many decades or centuries appears to contribute to the expansion and densification of *Guadua* bamboo stands (Shepard & Chicchon, 2001). *Guadua* stands undergo synchronous flowering and fruiting on long cycles of 15 to 30 years (Nelson, 1994; Shepard et al., 2001; Virtanen et al. 2022). Such "mast fruiting" on long cycles appears to be a mechanism tropical plants use to protect themselves from seed predators, producing such an abundance of seeds in a short period of time that animals simply cannot consume them all (Janzen, 1974). The **kapiro** fruit is a large, starchy capsule that resembles a gigantic grain of rice or wheat, and it is avidly consumed by parrots, peccaries and of course the Matsigenka. During a mast fruiting event, millions of **kapiro** seeds will fall on the ground throughout an entire region. Once fruiting is complete, the bamboo stands die back and rot completely. Over a number of years, the stands slowly grow back from seeds that survived the gluttonous feasting of humans and animals alike.

Along the Manu River, the Matsigenka attributed a massive **kapiro** bamboo die-back in the 1980s to the dark prowess of a powerful sorcerer. As loggers and oil prospecting operations invaded the territory of the isolated, neighbouring Nahua people throughout the 1970s, the Nahua intensified their raids on Matsigenka settlements, resulting in numerous casualties. One particularly feared Matsigenka sorcerer lost family members to Nahua raids, and was wounded himself when trying to escape by canoe. He is widely known to have recovered a leg bone from the skeleton of a Nahua man killed around 1978, inserted it into a **kapiro** stem together with a potion of dangerous sorcery plants, and buried it in a stand of bamboo (the Matsigenka note that dried bamboo stems look like long bones). Around 1981, bamboo stands throughout the region flowered, fruited, and died: the sorcerer's intervention

thus imposed a shortage of bamboo for arrows on the Nahua so they would relent in their attacks. Furthermore, the massive epidemics of respiratory illnesses that beset the Nahua beginning in 1985, killing nearly half their population, are also attributed to this act of sorcery (Shepard et al., 2010).

After *kapiro* bamboo stands die, arrow-making material becomes scarce for several years. A number of alternate bamboo species with similar stems are available, for example *shinkerokota* (the rarer form of bamboo with an even more powerful ‘poison’; possibly *G. sarcocarpa*) as well as *yaivero* (*Guadua glomerata*), a species that grows in abundance in seasonally flooded forests and areas with high clay content (Shepard et al., 2001). However, most Matsigenka hunters consider *yaivero* inappropriate as material for arrow points due to spiritual considerations, and some (but not all) also consider *shinkerokota* inappropriate. If a hunter kills game animals with arrow points made from *yaivero* (and, according to some, *shinkerokota*), the guardian spirits of the game animals, the *Saankariite*, become angry and send game animal populations far away (see also Fernández-Llamazares & Virtanen, 2020).

Such practices and conceptions around the role of different bamboo species in affecting game animal populations reveal complex associations between chemosensory, ecological, and cosmological considerations. The major alterations in forest structure that occur in the aftermath of a massive bamboo fruiting and die-back may alter the behaviour and territorial distribution of game animals for several years. On another level, the prohibition against making arrows during a wife’s pregnancy, together with cyclical periods of regional *kapiro* shortage for making arrows associated with mast fruiting, provide inherent social controls that may mitigate the impacts of hunting (see Shepard et al., 2001; Shepard, 2002). It is interesting to note that white lipped peccary herds also undergo cyclical, 10-to-15-year alternations between abundance and scarcity, which are not fully understood (Fragoso, 2004). Matsigenka conceptions suggest a series of hypotheses that could be used to test for possible associations between the mast fruiting of bamboo and the population dynamics of wild peccaries, as has been observed in southeast Asia for the mast fruiting of *Dipterocarp* species (Curran, 2000).

Guadua angustifolia, known to the Matsigenka as *manipi*, is the largest of the local bamboos, with thick stems that can exceed 12 m in height. This species occurs in relatively small, circular, stands along small stream beds surrounded by thorny branch shoots reminiscent of barbed wire. Prior to the arrival of Protestant missionaries along the Manu River, this species was an important aspect of Matsigenka funerary rites. The Matsigenka sometimes placed their dead within the protective circle of spiny *manipi* stands to protect the

corpse from vultures and other carrion eaters (Shepard, 2002). In this way, the corpse could lie undisturbed for an extended period of time, allowing certain special people (notably shamans, *seripigari*) to ‘stand up’ (*tinaanae*) and walk away into the forest or ascend the sky, joining the ranks of the *Saankariite* guardian spirits. Burial, introduced by Christian missionaries, thus dooms the Matsigenka to a less glorious, more mundane afterlife in the ‘Land of the Dead’ which is a pale shadow of life among the living (Shepard, 2002).

The hollow stems of several bamboo and grass genera (*Aulonemia*, *Olyra*) are used to make musical instruments such as flutes (*samatsi*) and pan-pipes (*songarensi*), whose breath-like qualities engage shamanic conceptions of creation, transformation and communication (see Virtanen et al. 2022, p. 1086 for similar conceptions among the Apurinã). One unidentified species known as *tiposhi* with especially brittle leaves serves as a rattle for shamanic ceremonies, and is believed to call and summon the invisible *Saankariite* spirits. The sharp, clean edges of the freshly split stem of a *Pariana* species known as *tiposhi* were once used as a sterile scalpel for cutting a newborn’s umbilical cord. These examples reveal the diverse sensorial properties, ritual and medical uses, and cosmological conceptions that surround different bamboo species.

The linguistically related Apurinã people in nearby Acre, Brazil, are also aware of the special life cycle of *Guadua* bamboo stands, and consider them to be both sacred and dangerous places where animals and ancestor spirits take refuge (Virtanen et al. 2022, p. 1088). Moreover, contemporary Apurinã conceptions and practices may represent legacies of ancient associations between bamboo stands and the enigmatic, possibly ceremonial sites of the southwest Amazon referred to as ‘geoglyphs’ (Virtanen et al., 2022, p. 1081).

Conclusion: A Sensory Ecology of Animacy

As we have argued, here and elsewhere, any interdisciplinary dialog into the animacy of plants must run two ways (Shepard & Daly, 2021). Previous elaborations of ‘ecosemiotics’ by Kohn (2013) and Hornborg (2001) have drawn upon the field of biosemiotics (Sebeok, 1994) as well as Gregory Bateson’s conception of an ‘ecology of mind’ (1972). And yet to date, ‘anthropology beyond the human’ (Kohn, 2013) and multi-species ethnography have tended to approach human-plant interactions as an extension of existing social theories and anthropological methodologies, which are ill-equipped to the task. As a case in point, existing ‘planthropologies’ (Myers, 2017) of Amazonia have tended to focus on domesticated plants (e.g., Oliveira, 2016; Maizza, 2017; Miller, 2019), whose reproductive cycles, sensory

properties and ecological interactions have been largely tamed by human domestication, for human ends.

Especially in such a diverse bio-geophysical and eco-cosmological landscape as Amazonia, social anthropological perspectives only stand to be enriched through dialog with ethnobiology, biosemiotics, and the emerging field of plant intelligence (Trewavas, 2016). By delving into existing scientific literature and appreciating the unique life cycles, phytochemical signals and ecological interactions of plants within forest landscapes, we have shed light on otherwise cryptic Indigenous conceptions (Edwards et al., 2009; Daly & Shepard, 2019). We have emphasized the role of the chemical senses for understanding human-plant interactions, while revealing the radical otherness of plant-personhood in Indigenous cosmologies (Daly & Shepard, 2019).

When investigating the life-worlds of non-Western philosophical traditions, it makes no sense (pun intended) to maintain the traditional disciplinary Cartesian divide between theory and methods in natural and social sciences. Far from being abstract, cerebral philosophies, Amazonian cosmologies embed thought and action in the pulse, thrum, and multisensory entanglements of the living forest world (Shepard & Daly, 2021). In developing the paradigm of sensory ecology (Shepard 2004; Shepard and Daly 2022) and the associated method of phytoethnography (Daly and Shepard 2019), we aim to bring sensorial relationships with plants into central focus in investigations of Indigenous life-worlds. In this endeavour, we have been inspired in particular by the work of Herdt (1984), Ingold (2000), and Rival (2012a).

The senses, and the chemical senses in particular, are a primary channel for understanding the flow of substances, essences, and energies between and among diverse bodies, beings, and layers of the cosmos in Indigenous ethnobotanical systems and shamanic philosophies. In this paper, we have provided examples from our own plant-based ethnographies and sensory ecologies of Makushi and Matsigenka life-worlds. We have focused especially on the role of toxic, caustic, and other noxious plant-derived substances as key elements in Indigenous concepts of plant animacy. We have also highlighted the complex interplay between cosmology, resource use patterns and traditional taxonomic and ecological knowledge around plant properties, life cycles and forest landscapes.

Indigenous Amazonian gardeners, hunters, foragers, and shamans are intimately aware of the sensory qualities and ecological interactions of useful and powerful plants. By exploring Makushi and Matsigenka uses and concepts, we have taken seriously their explanations of plant agency and relationality. Plants are integral to understandings of illness,

healing, and person-making in Amazonia, mediating relationships among humans and with various nonhuman entities. In examining the uses of various plants, including medicines, charms, shamanic or sorcery preparations and even practical technologies like arrows, we show how plant animacy in Amazonia is expressed through semiotic and sensorial processes of embodiment and ensoulment, defying Cartesian mind/body, nature/culture, and subject/object dualisms. Indigenous perspectives on plant animacy raise far-reaching questions about the meanings of body, soul, and nonhuman agency in Indigenous Amazonia, contributing to the relevance of anthropology and ethnobiology in the current moment of global environmental crisis. Thinking beyond modernist Cartesian binaries is critical for understanding ‘plant-people involutions’ (Myers, 2017) in the context of the Anthropocene, and its ongoing impacts on Indigenous peoples and their territories.

Though animism is arguably the oldest, and most outdated, colonial trope in the history of anthropology, new thinking about what we have dubbed here as ‘animacy’ has a dynamic, forward-facing orientation: a way of engaging modernity in the context of post-colonialism, capitalist extraction and the global climate crisis (see Hornborg 2006). Contemporary Amazonia reflects a complex intersection of Indigenous and non-Indigenous spiritual and religious practices which often come together in syncretic, creolised, or hybrid forms (cf. Halbmayer & Alès, 2012), both shaped by and responding to colonial and postcolonial histories of change and transformation (see Tamboli, 2023). The multivocality of Amazonian subjectivities, including animal, plant and other non-human persons, provides a template for decolonial methodologies and pedagogies: animacy as a form of anarchist resistance (cf. Scott, 1987). The cosmological and ecological concepts of Indigenous Amazonian peoples revolve around unique understandings of personhood relating to animacy and life itself. In order to include plants in these discussions, we have emphasized the distinctive ‘vegetal’ modalities of communication and multi-species relationality while highlighting the unique place of plants in Indigenous animism and theories of life.

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The authors declare that there is no conflict of interest.

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