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Article

Folkbiology in endangered languages: Cognitive universals and lexical relativity

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Abstract

Predominant theories of folkbiology emphasize universal aspects of human perception and cognition but have often been contested by research emphasizing cultural relativity. Drawing on languages that encode knowledge of endangered ecosystems, this paper argues that the contrast between universalist and relativist approaches to the folk classification of living kinds is a false dichotomy: despite the existence of cognitive universals based mostly on visual perception, there is abundant evidence that the lexical semantics of words and phrases denoting particular taxa and their relation to overt cultural expression vary cross-linguistically. Recent calls for the indigenization of knowledge highlight the need to illuminate parallel and complementary knowledge systems in line with efforts to decolonize academic research. I present a range of examples from Indigenous taxonomies that provide lexical windows into local ecology and belief systems and propose an analysis by which (i) universalist and relativist perspectives are not in conflict and (ii) Indigenous naming systems are of comparable social and scientific value to Western taxonomies. More generally, I suggest that a more comprehensive understanding of the linguistics of folkbiology is possible by moving beyond binary thinking in this domain.

Keywords: endangered languages, ethnobiology, folkbiology, lexical semantics, Traditional Ecological Knowledge (TEK)

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1 Introduction

In this paper, I contrast universalist and relativist approaches to the folk classification of living kinds (e.g., mammals, birds, reptiles, insects, plants, etc.) from a linguistic perspective, with a focus on endangered languages in endangered ecosystems. While this controversy once burned brightly in ethnobiology, it has receded into the background in contemporary research, and it is perhaps time to poke the embers. As Indigenous languages continue to go extinct in the most biodiverse regions on the planet, at a rate of one disappearing every two weeks, the question of what is universal and what is unique about naming systems for living kinds remains fundamental. Before plunging directly into debate, it is useful to reconsider in the most general terms the relationship between names and things.

There is a long tradition of emphasizing that there is no intrinsic link between the sounds chosen in a particular language for a particular word and the thing, event, or state in the world that the word represents. This perspective was advanced by Aristotle (Modrak, 2001), rearticulated in the early twentieth century by Saussure (1983 [1916]), and largely goes unquestioned in mainstream linguistic research. As Juliet intoned on her moonlit balcony, with Romeo hidden below in the shadows, 'What's in a name? that which we call a rose / By any other name would smell as sweet' (Shakespeare, 1986: 43–44). In an important sense, Juliet is correct. The name of this genus of flower does not affect our perception of its smell; similarly, our perception of its physical shape, usually comprising five petals, each divided into two lobes, and its thorny stem, with sickle-shaped hooks, is entirely independent of the linguistic label we attach to it, whether it be *rosa* in Italian, *méiguī* in Mandarin, or *waridi* in Swahili. From this perspective, it might seem that any object names in different languages should be fully interchangeable.[1]

However, as Rosaldo (1972: 83) observes, 'words often signify a good deal more than the objects designated as their referents'. 'What's in a name?' remains a prickly question in part because of the difference between sense and reference. As Frege (1980 [1892]) famously observed, the reference of a word is what it denotes, and it is external to the mind, while the sense of a word is its meaning in relation to the linguistic system of which it is a part. For example, the folk names *foxglove*, *witch's glove*, *fairy fingers*, and *dead men's bells* might all refer to the same plant (*Digitalis purpurea*), but they carry different senses. Contrary to Juliet's conjecture, many names of plants and animals across cultures do contain information as to the nature of the thing itself, whether it be the shape, the edibility, the medicinal value, the toxicity, or some other noteworthy characteristic. If she were to have left her home in Verona to wander in the hills of Northern Luzon in the Philippines, she would surely have been confused by the names bestowed by the Ilongot people upon the many varieties of sweet-smelling orchids. As documented in fieldwork by Rosaldo (1972), the generic term corresponding to 'orchid' is *lampuŋ*, though that is, properly speaking, the name of the 'spirits of high places' invoked in magic spells to cure certain kinds of sickness. Types of orchids have names such as *quduŋde* 'their thighs', *lukipe* 'their fingernails', *sinayakde* 'their braids', *qamaqamade* 'their thumbs', and *ge:lawagide* 'their fingers', and as such are conceptualized as being body parts of the spirits. As part of a steaming cure, a patient sits under a blanket with a pot containing a boiling botanical mixture, to which particular orchids are added. Through steaming, the assembled body of the spirit enters the body of the patient and is asked to lift the curse of sickness. Clearly, there is a tension between Juliet's affirmation of the universality of human perception and the culturally modulated onomastics of the Ilingot. An orchid by any other name would not be part of the same cultural world.

In the following sections, I first consider the impressive body of research on universals in the lexical encoding of folkbiology and acknowledge the legitimacy of research on language and ecology that sheds light on common aspects of human cognition. I then delineate some limitations of such research in terms of the fundamental relativity of word meaning inherent in the mental lexicon of any particular language. With such premises in place, I explore the implications of lexical relativity through a range of culture-specific examples of the classification of living kinds that resist translation into dominant majority languages and propose an analysis by which universalist and relativist perspectives are not in conflict. Finally, I suggest that previous iterations of this debate resulted in polarization or shoulder shrugging largely due to false dichotomies; the beauty of interplay between linguistic cognition and local ecological knowledge is revealed only when we move beyond simplistic binary distinctions.

2 Cognitive universals in language and folkbiology

Across theoretical frameworks in linguistics, research has tended to confirm the existence of at least some grammatical universals that give rise to patterns in culturally and geographically unrelated languages.[2] To a large extent, syntax and phonology are governed by cognitive principles common to all human beings and are independent of belief systems and ecological context. For example, in syntax, V2-languages (which require the second constituent of a sentence to be a finite verb) are found from the Northern European lowlands to the high mountain villages of the Himalayas, while serial verb constructions (which allow for complex predicate formation) can be found in the Amazonian rainforest, the Kalahari Desert, and the streets of Beijing (Stringer, 2016). Similarly, in phonology, use of paired (geminate) consonants is found from Italy to Japan; stress-timed languages are found from the Faroe Islands to Thailand; and attempts to tie tone languages to climate have ultimately foundered on closer examination (Collins, 2016). Such findings relate to one major concern of the linguistic enterprise, which is to shed light on the underlying architecture that all languages have in common, such that any child is born with the capacity to learn any language with ease within the first few years of life. However, it can be argued that cultural and environmental influences on language lie predominantly not in syntax or phonology but in the mental lexicon, an equally important component of the human language faculty.

Parallel discussions concerning cognitive universals have also occurred in research on folkbiology. A consensus among anthropologists began to emerge in the 1960s that there was an unmistakable unity in the various naming systems of plants and animals in all human languages (see, e.g., Berlin, Breedlove, and Raven, 1973; Berlin, 1992; Atran, 1998). This cross-cultural, general-purpose taxonomy classifies living kinds in terms of the same three basic levels of organization: 1) unique beginner/folk kingdom (*animal*, *plant*); 2) life form (*bird*, *fish*, *mammal*, *tree*, *shrub*); and 3) generic species (*goose*, *trout*, *fox*, *willow*, *honeysuckle*); with the possible addition of more specific names for subtypes of generic species, involving binomial and then trinomial compound nouns: 4) folk-specific (*snow goose*, *rainbow trout*, *red fox*, *pussy willow*, *trumpet honeysuckle*); and 5) folk-varietal (*lesser snow goose*, *coastal rainbow trout*, *Cascade red fox*, *rosegold pussy willow*, *sulphurea trumpet honeysuckle*). The striking universality of the taxonomic hierarchy itself, as well as the typological regularity in the recognition of particular life forms and generic species, across so many different cultures and environments, can be most convincingly explained by commonalities in human perceptual cognition, independently of usefulness or cultural significance to humans.

That an innate universal ranking system underlies our classification of animate entities also finds support in children's inborn enthusiasm for categorizing living kinds such as humans, nonhuman animals, and foods such as fruit (Gershkoff-Stowe and Smith, 2004). Studies have shown that even children born in urban environments, somewhat disconnected from the natural world, will often seek out populations of nonexistent creatures to classify with eagerness and precision, whether they be dinosaurs (Yoon, 2009: 164–165) or artificial characters such as Pokémon (Balmford, Clegg, Coulson, and Taylor, 2002). The development of this domain of vocabulary also appears to unfold in similar ways across languages. For example, as discussed by Brown (1984: 92–96), the acquisitional sequence for plant-related terms is largely the same for children acquiring both English and Tzeltal.

If humans are born with an intrinsic ability to classify animals and plants, then we might expect there to be evidence from research into the workings of the brain for a neural substrate underlying this capacity. In fact, through disease or trauma, patients can develop a domain-specific impairment for recognizing, ordering, and naming living things. While retaining the ability to distinguish inanimate objects, such patients seem completely stumped by things such as kangaroos, parrots, spiders, crocuses, or mushrooms (Yoon, 2009: 146–170). As the distinction between life and non-life underlies our knowledge of what is potential food versus what is inedible, the results of this condition can be catastrophic. While the patient J.B.R. was suffering from herpes-induced encephalitis, following a grand mal seizure, and unable to name camels or buttercups (while being able to describe flashlights and compasses), he tried to eat soap, paper, and blankets, and to drink shampoo (Greenwood, Bhalla, Gordon, and Roberts, 1983; for similar cases, see Silveri and Gainotti, 1988; Sheridan and Humphries, 1993). Patients exhibiting such symptoms all suffered lesions in the temporal lobe, and brain-imaging research on object-naming in healthy patients has revealed that the location of our capacity to recognize, order and name living kinds lies in the superior temporal sulcus and the lateral fusiform gyrus (Martin, Wiggs, Ungerleider, and Haxby, 1996; Van Schie, Wijers, Mars, Benjamins, and Stowe, 2005).

Despite the existence of universals in human cognition underlying both language and folkbiology, it remains paradoxically true that that, in various respects, 'grammars are shaped by culture and environment' (Harrison, 2007: 211), and that there are profound differences in folkbiological classification. The lexicon does not exist in isolation from grammar, and the meanings of words invariably diverge across languages, whether in productive vocabulary such as nouns and verbs or functional elements such as prepositions or classifiers. For example, grammatically relevant lexical features like HUMAN and ANIMATE, which are carried on nouns, play a role in the grammars of all languages. The presence or absence of the feature HUMAN can determine possible relative pronouns in English, e.g., **the book <u>who</u> I read last week*. Similarly, only entities classified as ANIMATE can be selected by the Japanese existential verb *iru* 'to be', e.g., *heya ni onna ga <u>iru</u>* '<u>there is</u> a woman in the room' vs. **heya ni hon ga <u>iru</u>* '<u>there is</u> a book in the room'. In Diné (Navajo), basic word order depends not on subject vs. object, but on the positions of entities in a cosmic ladder of animacy, e.g., humans, lightning > children, bears > cats, eagles > ants, spiders

> wind, fire > trees, rocks > abstractions (thirst, age) (Young and Morgan, 1987: 171–172, drawing on Creamer, 1974). Thus, in any sentence about a boy (*ashkii*) and a dog (*łééchąą'í*), the boy will precede the dog, e.g., *ashkii łééchąą'í yi-noołchéél* 'the boy is chasing the dog' vs. *ashkii łééchąą'í bi-noołchéél* 'the dog is chasing the boy', with verbal prefixes indicating which participant should be interpreted as the agent in the event. However, while concepts such as HUMAN and ANIMATE appear to be universally available as grammatical features, what actually counts as human or animate may vary from culture to culture. In Ecuador, Achuar hunters conceptualize toucans and howler monkeys as brothers-in-law, while Achuar women talk to their plants in the village garden using a language of address otherwise reserved for children (Descola, 2013: 4–6). Not only animals but certain plants may be understood to have human-like souls. In Mali, Dogon healers consult trees to ask them about their knowledge of the forest, and some trees, such as the kapok (*Ceiba petandra*), are believed to move around at night, having conversations with other trees in the forest (Descola 2013: 27). In such cultures, the boundaries of social interaction extend beyond the human. People have considerable choice in how they conceptualize the outside world and whether they perceive a separation between humans and other animals, between animals and plants, or between culture and nature.

3 Lexical relativity and ethnobiology in endangered languages

3.1 The gloss trap

The documentation of naming systems in ethnobiology is enhanced by the assumption that names in two languages are likely to have different senses, even if they share the same referent. In advance of an analysis of relativity in the classification of living kinds, it helps to situate the discussion in the context of the general impossibility of literal translation. Lexical relativity is a fundamental organizing principle of human language by which the precise meanings of words depend fundamentally on the existence and particular semantics of other words in the same lexicon and are systematically different across languages (Stringer, 2010, 2019). While supposedly equivalent words in different languages can denote the same entities in the world, the shared denotation in effect never applies across all contexts as there are differences in extension (the precise set of entities the word can describe), polysemy (related meanings captured by the same word), and connotation (such as positive or negative nuances). When linguists create word-for-word literal translations, called glosses, to facilitate comparative syntax, this often leads to a 'gloss trap', as assumed equivalences fall apart on closer examination.

For example, a universal human activity such as drinking does not lead to universal verb semantics. The English verb *drink* is used only of liquids. In Turkish, one can also drink smoke (as in *drink a cigarette*), as the verb subcategorizes liquids and gases; in Japanese, one can drink medicine, even in solid form; and in Kazak, one can drink both liquids and solids, in contexts where English would require the verb *eat*. Young and Morgan (1987) list fifteen verbs of consumption in Diné, corresponding to either *eat* or *drink*, which differ according to such criteria as whether the thing to be consumed is hard, mushy, leafy, liquid, solid but dunked in liquid, or meat, or whether it is consumed from an open or closed container. Similarly, common nouns splinter in translation: English *rice* corresponds to both Japanese *kome* 'uncooked rice' and *gohan* 'cooked rice'. In English, *grape* is a count noun (and grapes are conceptualized as small, bounded objects) while in French, *raisin* 'grape' is a mass noun (and conceptualized as an aggregate). In French one must refer to a grain of grape, just as in English one must refer to a grain of rice. The myth of lexical equivalence is especially apparent in research that focuses on comparing any two specific lexicons in detail. When Wierzbicka (1985) attempted to provide complete semantic descriptions of common English words, she was not able to find an exact match with a single one of their analogues in Polish: something is lost even when translating names for commonplace objects as *cup* or *shirt*. With such examples in mind, we can see that lexical relativity bears directly on the nature of translation in ethnobiology. A shift from one lexicon to another entails thousands of subtle shifts in how we conceptualize names of living kinds in order to talk about them.

3.2 Relevance for ethnobiological research in endangered cultures

An understanding of lexical relativity can greatly inform our sense of what else is lost when a language is lost; what is gained when language use is rekindled; and how language revitalization might play a role in the preservation of Traditional Environmental Knowledge (TEK). It is well-understood that most of the world's Indigenous languages are spoken in geographical regions with extremely rich variation in languages (many of which are endangered) and populations that display a high degree of multilingualism (Harrison, 2007; Evans, 2022). These zones of language complexity overlap significantly with biodiversity hotspots, similarly defined in terms of a multiplicity of threatened species (Gorenflo, Romaine, Mittermeier, and Walker-Painemilla, 2012; Loh and Harmon, 2014). It follows that when ethnobiologists conduct research in some of the most biodiverse places on earth, it is invaluable to have an understanding of the TEK that is linguistically encoded by communities often at risk of either displacement, acculturation, and, in many cases, partial or complete language loss.

That culture-specific vocabulary and grammar related to ecology is at risk of catastrophic loss if a community shifts to a dominant language is no mere hypothetical. In Venezuela, Jotï children living in a traditional forest habitat have a knowledge of ethnobotany similar to their parents by age 10, including names of up to 220 edible and 180 medicinal plants, but those who have shifted their language dominance following acculturation in mission villages exhibit dramatic loss of such knowledge (Zent, 2009). Similarly, one study involving 6,190 high school students with 392 Indigenous languages in Papua New Guinea found that, in a single generation, there was a tragic vanishing of lexical items denoting birds, closely correlated with language shift (Kik et al., 2021).

In light of lexical relativity, it is clear that conventional attempts to salvage ethnobiological knowledge by creating bilingual word lists of supposedly equivalent vocabulary may in fact be counterproductive, as this practice encourages people to see words only in terms of reference and not sense, thus devaluing Indigenous taxonomies. More sophisticated initiatives have embraced a biocultural perspective, embedding lexical information in cultural contexts. For example, the Kimberley Language Resource Centre in Australia has gone beyond ‘just a list of words in publications’ for ethnobotanical vocabulary (Maffi and Woodley, 2010: 62) by creating audio and visual materials in local languages such as Jaru and by creating opportunities for language immersion for young people on trips to the bush. In Colombia, the ecological and cultural restoration of the sacred site Jaba Tañiwashkaka over the past decade has been led by an intercultural team of Kogui community members and staff members of the Amazon Conservation Team (ACT). This has made possible both the recording of the names and oral histories of species in the Kogui language to preserve this knowledge for future generations, in parallel with Western scientific documentation and ecosystemic analysis (Hoffman, Londoño, Velasquez, and Plotkin, 2023). Other recent ethnobiological projects that meaningfully engage with the linguistics of Indigenous taxonomy include Rapinski, Cuerrier, Harris, Ivujivik, Kangiqsujuaq, and Lemire’s (2018) study of Inuit knowledge of marine organisms in Nunavik, and Hidayati, Franco, and Suhaimi’s (2022) research on Urang Kanekes ethnobotany in Banten, Indonesia.

Despite increasing recognition of the imperative to value Indigenous knowledge as on a par with scientific scholarship, much current biocultural research remains largely guided by Western preconceptions, such as how a more complete understanding of language variation will help complete the picture we already have of human cognition or how traditional ethnobotanical practices can point to alkaloids that can be synthetically reproduced for medical use (and monetization). Indigenous academics, who have bridged the divide between emic and etic ways of knowing, continue to argue that we remain in need of a paradigm shift so that, for example, collaborative linguistic work should have at its heart Indigenous needs, goals, values and cultural norms (Leonard, 2021). Similarly, biological science stands to gain from a ‘dance of cross-pollination’ with Indigenous knowledge, potentially making possible ‘a new species of knowledge, a new way of being in the world’ (Kimmerer, 2013: 47). Fundamental to this endeavor is a willingness to engage with language. In Mika’s (2016) discussion of Māori linguistic philosophy, he explores the connection between language and worldview, and describes language in terms of ‘the worlding of things’ (p. 165). This expression captures the insight that we understand the world not only as we perceive it but as we describe it in our languages, leading to pluriversal epistemologies. Indigenous conceptualizations and classifications of living kinds exemplified in the following section reveal how the lexical encoding of ecological knowledge in natural languages is often culture-specific, ecosystem-dependent, and able to provide unique insights into the behavior, ecological roles, utilitarian value, and cultural significance of animals and plants.

4 The cultural classification of living kinds

4.1 Linguistic encoding of ecological and utilitarian knowledge

When animals or plants have high cultural significance in a particular community, this can result in sophisticated folk classification. Posey (2002) documents how the Kayapó of Brazil distinguish 56 types of bees, grouped in 15 families. Names for bees can depend on behavioral characteristics (e.g., flight patterns, aggression, sound in flight, places typically visited), nest geometry, and ecological niche (e.g., preferred nest site, position of entrance, characteristics of the entrance structure, whether found in flood forest, humid forest, or savannah), physical characteristics (e.g., shape, color, smell, markings, type of wings, secretions), or use to humans (e.g., quality and quantity of honey, quality of resins or wax, edibility of pollen or larvae). Such naming systems, based on observation in a particular ecological context, are arguably more relevant to conservation efforts than scientific nomenclature.

Similar examples of naming according to utilitarian value or environmental location are found across languages. Utilitarian classification is found with butterfly and moth larvae in Tzeltal, Mexico (Hunn, 1977: 280–285, 301–306), and reindeer naming in Todzhu, Siberia (Harrison, 2007:30). Environmental location is encoded in plant naming by the Cherokee of North Carolina, in which folk-specific varieties are binomial, including words such as *igatenehi* ‘swamp-growing’, *gutluta* ‘living on hillsides’, and *kutlaehi* ‘growing under beech trees’

(Cozzo, 2002: 143–144). It is important to note that any human language has the capacity to encode detailed utilitarian or environmental information. For example, in English there is specialized folk terminology in horse breeding or falconry (e.g., a *gelding* is a castrated adult male horse, three years or older; a *brancher* is a young hawk, almost completely feathered, not completely capable of flight). However, the fact remains that such naming systems are culture-specific and often endemic to particular ecosystems. As such, the loss of a language may entail the loss of vital, regional TEK.

Environmental information may be carried not only on common nouns but on grammatical morphemes attached to vocabulary items. One such system is found in Piaroa, spoken in Venezuela. Immediately following the noun there is a classifier position that must be obligatorily filled, with few exceptions. There are over one hundred noun classifiers, about seventy-five of which specify botanical or ecological information about the noun to which they are attached. For example, the addition of *-roe* classifies the object as a kind of hanging, branching-stemmed fruit bunch; if *-k'oe* is used, the object is understood to be a rosette-shaped herbaceous plant; and if *-ya* is added, the substance is categorized as a thin, free-flowing sap (Zent, 2009: 106–107, drawing on Krute, 1989). Sometimes the classification of nouns is not marked directly on the noun itself but on numbers when nouns are counted (Aikhenvald, 2003), and such classifiers may also encode ecological information. In Minangkabau (Indonesia), numerical classifiers are used to differentiate between seed-like objects (marked with *incek*), flowers or leaves with stalks (*tangkai*), and clumps of plants (*kalupah*), while Baniwa (Northwest Amazonia) has a special numerical classifier (*-ʃa*) for types of excrement, because of the importance of identifying animal droppings when hunting game. Such systems are lost when speakers switch to languages less rooted in the local environment.

Yet another type of ecological information encoded in endangered languages concerns the changing of the seasons. Many Native American tribes have their own set of month names related to hunting, fishing, gathering, or planting activities in particular ecosystems. The equivalent of April is *iskigamizigegiizis* 'Maple Sugar Moon' in Ojibwe, *wahsakayu:té:se'* 'Thundering Moon' in Oneida, *mağá okáda wí* 'Geese Laying Eggs Moon' in Dakota, *hash bissi* 'Blackberry Moon' in Choctaw, and *guwoni* 'Duck Hunting Moon' in Cherokee. Seasonal cycles may be defined not only in terms of human interaction with other species, but the behavior of the animals or plants themselves. For example, the whole annual cycle is named by the Karajá people of Brazil in terms of the behavior of two local species of turtle (Fortune, 1990).

It seems evident from these culturally modulated examples of the linguistic encoding of ecological knowledge that universals in folkbiology are not the whole story, and the choice between universalism and relativism must be based on a false dichotomy. Part of the solution lies in the fact that humans are not restricted to a single system of classification, whether of living kinds or of calendar cycles. The following two subsections consider in turn the phenomena of parallel taxonomies and fluidity in classification within a single system.

4.2 Parallel systems of classification

One fundamental flaw in the assumption that folkbiology can be reduced to a single universal hierarchy that matches Western classification systems may be illustrated by reconsidering the influential classroom experiment discussed by Berlin (1992: 9–10), involving the categorization of birds. American students were asked to sort out a pile of unfamiliar, colorful museum skins from the Peruvian Amazon, including two or three examples of each species. They instinctively and reliably reproduced the groupings used by both biologists and the Huambisa and Aguaruna Jivaro peoples who were the source of specimens, which is almost certainly indicative of universals in human visual cognition. This has been taken to confirm the validity of a single, universal folkbiology. However, students could not possibly have classified these unknown species, displaced from their natural environment, in any of the other ways that people group living kinds: in terms of their ecosystemic significance (the food they eat, their association with other species, the seasonal changes they herald), or utilitarian value to the community (the uses of their feathers, their edibility, their ability to indicate other sources of food), or the sounds they make.

That Indigenous peoples have naming systems based on visual perception that correspond to those of ornithologists does not preclude the possibility of parallel systems of classification. In his classic account of his fieldwork with Kaluli people in Papua New Guinea in the 1970s, Feld (2012: 46–60) documents how there is, as expected, a bird classification system based largely on appearance, including familiar groupings. But at one point in Feld's narrative, his informant, Jubi, becomes frustrated and exclaims, 'Listen – to you they are birds, to me they are voices in the forest' (p. 45). The emphasis on sound is relevant not only because people perceive and recognize birds in the forest primarily through this medium, but also because these may actually be the voices of human ancestors: when villagers die, their souls enter the bodies of birds. The sounds themselves have an outside, which can be used to identify the species, and an inside, which can be understood as spirit communication. The Kaluli in fact distinguish seven groupings based on sound: those that say their names (*ene wi salan*); those that make a lot of noise (*mada ganafodan*); those that only make sound (*imilisi ganalan*); those that speak the Bosavi language (*Bosavi to salan*); those that whistle (*holan*); those that weep (*yelan*); and those that sing *gisalo* song (*gisalo molan*).[3] Systems of animal and plant classification that run parallel to taxonomies based on visual cognition often crosscut biological genera. In Cherokee plant taxonomy, intermediate taxa include the grouping *gawsuki* 'smeller', which are strong-smelling plants, including mints, spicy scented herbs, and muskmelons (14 species, 10 genera, 4 families). Another is *unistiluisti* 'stick flat to hairy substance', which are all plants with burrs (15 species, 13 genera, 8 families) (Cozzo, 2002: 141–142).

It should be clear that parallel systems of classification apply to folkbiology in any language, not just Indigenous languages under pressure of language shift. In English, classifications such as crops, flowers, and weeds are examples of variable systems of folkbiology, utterly independent of scientific taxonomy, depending on cultural evaluations of what is considered plantable, beautiful, or useless. Animals may be also classified in parallel groupings, whether in terms of use, such as pets (guinea pigs, goldfish) or farm animals (chickens, cows); or location, such as sea creatures (shark, octopus). This is particularly evident in food practices: tomatoes and avocadoes are usually conceptualized as vegetables (and categorized as such on supermarket shelves) while technically considered fruit; the folk term *berries* subsumes strawberries and raspberries, which are not, botanically speaking, berries, and usually excludes botanically defined berries such as chili peppers and watermelons. Parallel systems of classification stand in contrast to the narrow scope of approaches that emphasize universals in taxonomy based only on physical form. Alternative taxonomies appear to exist in conjunction with universals in all languages. However, there is a further layer of complexity, as languages also allow for variation inside a single classificatory schema.

4.3 Fluidity within naming systems

In addition to switching between alternative taxonomic systems, languages allow for fluidity in classification *within a single naming system*, for at least two reasons: first, because entities in the world may be conceptualized in different ways; and second, due to naming taboos. Alternative conceptualization in the same naming system is arguably found in all languages. For example, while some English nouns are invariably count or mass (such as the count noun *grape*, discussed above), the same turkey displayed on a table may be linguistically encoded as either *a turkey* or *some turkey* depending on whether the speaker conceptualizes it as an object or a substance. This kind of choice in how we classify is found not only in grammatical function words but also in open-class vocabulary. As noted by Atran (1999: 194–195), English speakers use the term *animal* to refer to at least three different classes of living kinds: animals including humans, animals not including humans, and mammals as prototypical animals (for instance, when people contrast animals with birds). In similar fashion, the term *plant* can refer to the whole plant kingdom or just to smaller leafy plants that are not trees.

Fluidity in reference to folk species can also arise due to taboos associated with naming people whose personal names derive from animals or plants. In many Australian languages, there is a taboo on naming a deceased person for a period of time, and in such cases the taboo extends to related names referring to animals, plants, or the environment. If a man is named *Yab-woorack* ‘woorak leaf’ because he was born under a *woorack* ‘banksia’, then the plant itself must be temporarily referred to by a different name following that person’s death (Clark, 2007: 17–18). As many cultures extend the concept of the soul to animals and plants, this kind of pronunciation taboo can also be found in dealings with other species. For Pälawan people in the Philippines, the collecting of honey involves complex negotiations with the spirit world. Humans are understood to inhabit the middle realm of a universe with three levels. Bees are said to be creatures of the upper world, seasonally descending to gather pollen from flowering trees. In order to attract bees, people must enter into negotiation with the Master of Flowers and perform appropriate ceremonies so that the trees welcome the bees. When the relevant trees are in flower, people are prohibited from using their normal names, such that these trees all have alternative names. For example, the *natuq* tree (*Payena* sp.) becomes *bäbäqälän*, the *dipanga* (*Pometia pinnata* Forster) becomes *kärän kärän*, and the *ginuqu* (*Koompassia excelsa* Taub.) becomes *pagibutän*. This is parallel to the practice of avoiding names for elders in this community, who must be respectfully referred to as grandfather or grandmother (Novellino, 2002).

4.4 Classification modulated by belief systems

The bestowing of personhood on birds in Kaluli culture and on trees by speakers of Pälawan, as discussed above, reveals not only parallelism and fluidity in naming systems but also how belief systems are intertwined with the language of ecology. The literal personification of an animal or plant may influence performative expression, whether in recited narratives, songs, festivals or more discreet rituals involving hunting or gathering. When a Pälawan gatherer needs to fell a gumbja sago palm, he must enter into ritual battle (Novellino, 2002). He wears a warrior’s headband and must first go through the motions of a duel, using a bush knife to fight the tree, whom he addresses as *käläng taw* 'Big Man'. After the tree has been felled, he takes up a spear and thrusts it into the trunk while shouting that the Big Man is finished. Comparable prescriptions of behavior can be found not only with plants and animals but also with the larger ecosystem if, for example, a whole forest is personified. In various cultural groups in Siberia, a hunter must forge an alliance with the Spirit of the Forest before venturing on an expedition by having sex with the Spirit's daughter in dreams (Descola, 2013:18). The belief that the soul can travel during sleep means that this relationship is not just imaginary for the hunter, who must also refrain from intercourse with his wife during this period (a kind of non-performative expression).

Nonhuman personhood may also be ascribed to the spirits of rivers, or mountains, or demarcated natural regions. While not news to Indigenous people around the world, the idea of environmental personhood has gained wide recognition in academia, law, and politics in recent years, following several successful attempts to petition governments to grant juristic personhood to environmental entities: Te Urewera and Te Awa Tupua (the Whanganui River) in New Zealand (legally recognized in 2014 and 2017, respectively); the Atrato River in Colombia (2017), the Ganga River Basin (2017) in India; as well as recognition of a more all-encompassing spirit of Pachamama in Ecuador and Bolivia (Act of the Rights of Mother Earth, Ecuador, 2008; Law of the Rights of Mother Earth, Bolivia, 2010) (for comparative discussion, see Gordon, 2019). As Studley (2019: 70) makes clear in his analysis of ecology and mountain religions in Tibet, conservation in such cases cannot be abstracted from the Indigenous reality of humans being part of nature, with the ideal of *snod bcud do mnyam*, 'topocosmic equilibrium', between various life forces. All these examples involving animals, plants, and landscapes point to a simple truth: that the basic dichotomies of human versus nonhuman, or culture versus nature, so often assumed in linguistics and biology to be universally applicable, are in fact subject to cultural relativity.

5 Conclusion

Returning to the question of commonalities and cultural particulars in the linguistics of folkbiology, it seems clear that dichotomous thinking itself, so fundamental to Western philosophical and scientific argumentation, is part of the problem. There is a belated but growing awareness in both the linguistics and ethnobiological academic communities that conventional models of research with binary divisions between universality vs. relativity, science vs. Indigenous beliefs, and academics vs. informants, must be rigorously challenged as the academy itself is decolonized. In linguistics, the once-heated debate between those who seek to understand universals of language and those see language as a window into individual cultures has resulted in two halves of the field, each working semi-independently while disparaging the other (see e.g., Pinker, 2007, and McWhorter, 2014, skewering neo-Whorfianism; and Deutscher, 2010, and Evans, 2022, on how Chomskian linguistics is little more than intellectual moonshine). In ethnobiology, following a no less impassioned history of debate (see, e.g., Berlin, 1992; Ellen, 1993), the opposition between these different perspectives has not split the field but, to the contrary, has been accurately acknowledged as a productive tension and shifted into the background of current research.

Arguably, however, there remains in ethnobiology a need to fully recognize the positive potential of linguistic analysis to shed light on the cultural classification of living kinds. The encoding of ecological knowledge in the nominal domain (nouns, numerical and possessive classifiers, lexical relations, etc.) and the verbal domain (verbs, affixes, subcategorization, etc.) results in a series of ciphers that only have meaning for particular communities in their own social, cultural, and natural environments. Any sharing of Indigenous ecological knowledge must be with an understanding of and respect for lexical relativity: the axiom that the meanings of words are endemic to the language in which they are ensconced. An additional issue for bilingual ethnobiological research is that our shared cognitive architecture makes possible parallel systems of classification, subsuming not only perceptual, utilitarian, and ecological criteria but also fluidity of classification within systems, involving shifts in conceptual perspective or transient cultural taboos. In the context of the current global experience of mass extinction of both languages and species, it is broadly understood that there is a pressing need for greater interdisciplinary efforts in linguistics and biology to promote biocultural diversity conservation. A keen awareness of lexical relativity can only benefit such efforts.

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Notes

1. The concept of the arbitrary nature of the sign is not to be equated with the notion that languages do not contain sound symbolism, as suggested by an anonymous reviewer. There is nothing whatsoever about /r/, /oʊ/, or /z/ (or the unrelated phonemes in *méiguī* or *waridi*) that points to the flower; but this does not preclude, for example, the use of voicing or vowel height to convey degree or duration (on mimesis in language, see Stringer, 2011; for discussion of sound symbolism in folk taxonomy, see Berlin, 1992: ch. 6).
2. Some linguists insist that universals of grammar stem from an innate language faculty (e.g., Jackendoff, 1990), while others maintain that they arise as part of general cognition (e.g., Talmy, 1985), but almost all linguistic frameworks accommodate the existence of universals. That researchers in other fields of inquiry such as cultural anthropology sometimes dismiss all accounts based on shared mental architecture is not at issue here.
3. Note that this fundamental classification by sound seems to contradict Berlin, Breedlove, and Raven's (1973) relegation of such systems to 'special-purpose' folk-biological classification, in contrast with the 'general-purpose' visual taxonomy shared by all humans. The previously discussed system of bee taxonomy in Kayapó also shows that different systems of equal importance can overlap in the naming of related species and families.

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