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Biosemiotics and ecolinguistics: two tales of scientific objectification

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Abstract Science builds on what people say and, thus, the use of signs. In pursuing this important observation, I contrast two views of knowing that look "beyond" sense impressions. I begin with John Deely's (2015) theory that self-referring symbols allow critical control of objectification. In showing the limits of science, he targets what he calls "solipsism". In all animals, Deely thinks, knowing draws on sign relations. However, humans, and only humans, grasp that these relations are *pure*. Our self-referential "symbols" disclose *ens reale*, or that which is «independent of finite awareness» (2015: 175). Given this epigenic break (Deely 1966), humans alone «know that there are signs» (Maritain 1970). *Ex hypothesi*, we can all embrace a/the non-finite knowing: on his post-modern view, moreover, scientific objectifications pick out a small part of what awareness can reveal (*ens rationis*).

Wary of ontological proliferation, human powers can be traced to evolutionary history. On an ecolinguistic view, semogenesis (Halliday 2003) informs vocalizing and, in many societies, writing too. Practices, social activity and knowing thus co-evolve. As infants learn under verbal constraints, they concert socially to become persons who make use of material engagement. As contingencies arise, they set off prompts or languagings (Sellars 1960) that afford rich semiotic description and coordinate social experience. Languaging, or language activity, informs practices as people learn from what happens. Perduring verbal and other patterns bind action, talk, ritual, objects and *objectifications* or, I suggest, "seeing through the eyes of others". In many practices, texts, images, data sets and institutions, together with careful control of methods, stabilize observations and models. These are what groups treat as collective knowledge. Even without a semiotic ontology, what people do, say and observe places narrow limits on the scope of science. Knowledge is grounded in *belief in* signs.

Keywords: Biosemiotics, ecolinguistics, distributed language, semiosis, bioethics, languaging

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> "When I use a word," Humpty Dumpty said, in rather a scornful tone, "it means just what I choose it to mean—neither more nor less." "The question is," said Alice, "whether you can make words mean so many different things." "The question is," said Humpty Dumpty, "which is to be master." (Carroll 1871: 190).

0. Introduction

Endorsing what Humpty Dumpty calls *words*, Hoffmeyer claims that, «to maintain that language is nothing special is quite absurd» (1997: 97). In, tracing language to a natural history, I prefer the view that language exerts special effects. Thus, like John Deely and Gregory Bateson (1979), I regard mind and nature as a necessary unity. The filter of natural selection places limits on both signs and also on social and material engagement. In mammals as diverse as lions, elephants and humans, perceived contingencies shape knowing how to act (which signs can describe). In humans, language both extends these bounds and also sets narrow limits on scientific knowing. Having explored the logic of Deely's work, I later offer an ecolinguistic alternative to invoking a semiotic ontology. For Deely, language makes us "special" in that it discloses a domain that lies beyond finite awareness. This is possible because ways of knowing shared with non-human animals are extended by human use of "symbols" or patterns that allow correct ways of attending by using signs founded in what lies "above and beyond".

As many will be wary of such an ontology, I sketch a deflationary alternative. In so doing, I follow Michael Halliday (1987) in tracing human construals of experience to semogenesis – acts that draw on verbal patterns. In what Sellars (1960) calls languagings, ways of attending allow correct modes of expression that mesh expertise, contingencies and circumstances with thoughts and sayings. On this ecolinguistic view, special effects depend on verbal (and related patterns); these make science possible and place limits on its scope. Where blind to the limits, we may overestimate scientific knowledge and place trust in markets and technologies. The results have had a massive «impact on rates of extinction, and consequences for life on Earth» (Foley 2016: 12). To reverse negative outcomes like these, we can gain from considering how science is integrated with what we do (and do not) know.

While concurring that languaging or "language" limits the scope of science, one can approach objectifications in various ways. Whereas many biosemioticians stress the "symbolic", the ecolinguist can turn to how writing systems extend older ways of languaging. In §2, I use a biosemiotic context to outline Deely's challenge to what he calls "solipsism". In §2.1, I turn to ecolinguistics and languaging. In §3.0, I stress that, on both views, science is limited by what are loosely called symbols. In §3.1, I trace Deely's ontology to a theory of symbols (viz., as self-referential pure relations). In §3.2, I challenge organism-centrism to offer a wider view. Instead of opposing solipsism, I trace objectification to its historical roots in social practices. Hence, in §4, I compare advertising with science to trace how practices use objectifications to enable collective projections. In §4.1, I stress that knowledge is incarnated through familiarity with organised practices. In §4.2, I reiterate that, however we view objectification, languaging/ language place science within narrow limits. Urging humility, I conclude, in §5, with remarks on how ethical issues bear on how science can be put to work in re-imagining the future.

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1. Biosemiotics

Biosemiotics covers a wide range of views that trace the co-evolution of meaning and life to interpretative processes (Barbieri 2007). On one end of a cline, life arises as cells self-fabricate by using adaptor systems (RNA complexes) that draw on organic codes (Barbieri 2018). Unlike artificial processes, metabolism evolves, is adaptive, and context sensitive. While provoking fierce debate (e.g., Champagne 2016, Kravchenko 2020), since life is not just biochemistry, such coding can be *described* as interpretative. Barbieri's model led to discovery of codes (Barbieri 2019) and, thus, new models of adaptors (Cowley 2019c). At the other end of the cline, many biosemioticians reject mechanistic models. Even if allowing for evolving, adaptive and context-sensitive outcomes, their mechanistic aspect is said to mask the interpretative essence of the living. In Deely's (2015) terms, Barbieri's theory is *mind dependent*. Hence, to extend the semiotic vision, Deely prioritizes an interpretative or "post-modern" view of life and/or the cosmos. As explained below, he proposes that signs are founded in suprasubjective relations that are independent of finite awareness. By contrast, Markoš and Švorcova (2019, 2020) offer a hermeneutic middle way. They view biosemiotics as an extension of mainstream biology within which both bio-mechanisms and signs co-evolve. Biosemiotics can pursue multiple scalarities of living: life meshes hardwired solutions, epigenetics, networks, and even historical contingencies. Later, the same logic of multiple scalarities will be applied to the body's linguistic extensions.

What semiotics is presents Deely's (2015) post-modern view. He presents an ontology which, he thinks, independently supports Peirce's triadic view of signs as "essential" to life. He begins by challenging the "naïve objectivity" of scientific models that posit an "is-ness" that sustains knowledge. As Deely points out, scientific knowing is often ascribed to a realm of the senses. Even if extended by instruments and mathematics, the objectively valid is taken to use an «epistemological conception of mind» (Cowley & Spurrett 2003). As Deely puts it, «mind in knowing knows only its own products of its own workings» (Deely 2015:71). Simply, knowing is predicated on individual powers (viz. how an individual knows). If this is so, we lack a viable account of how knowing contrasts with *believing* or, indeed, how individuals know what they know. A focus on critical control of objectification masks what Deely deems a problem. Since he assumes it draws on individual experience, he deems this a problem ofsolipsism. To avoid it, Deely suggests Deely starting with, not sense impressions, but signs. Whether informal or scientific, signs, pure relations, deliver knowing founded in mind independent relations. In all animals, they disclose what, in mediaeval times, was called *ens rationis*. Science thus extends animal knowing (and basic human understanding) by critical control or objectification (Deely 2015: 75). It builds on sign relations even without «the use of instruments» (Deely 2015: 75).

The view faces an obvious question. What are sign relations? Deely's ascribes them to, not evolutionary history but an ontology. In his arcane terms (discussed below), they *provenate* from «over and above subjectivity» (Deely 2015: 75). Signs are said to attest to a suprasubjective that is independent of finite awareness, an *ens reale* that defies explication. In biosemiotics, many (but not all) accept this ontology. While one cannot argue for (or against) pure relations, Deely presents the view as fully consistent with Peirce's vision of semiosis. Alternatively, in von Uexküll's (1992) terms, signs can open up Umwelten or, in Sebeok's (1988), what is disclosed by first-order modelling systems. Hence, non-human animals rely on signs but, of course, do not *know* that they know. An epigenic break (Deely 1966a) separates them from *Homo sapiens* in that humans can, and do, "know" that there are signs. It is in this fiduciary sense, therefore, they *provenate from the suprasubjective*.

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For Deely, humans "know" what they know because they draw on "language". Deely ascribes our remarkable power to the self-referential role of "symbols" (for example, 'x = x'). A seemingly trivial relation specifies, in the first place, how signs can be known (not just familiar). Moreover, as self-reference also serves in knowing about "objects", signs are more than "intersubjective" or conventional. For Deely, signs connect what can be collectively expressed to what semiosis discloses (i.e., *ens reale*). Given this ontology, a symbolic web and everyday knowing can also be used to bring signs under critical control. Given methods and regularities, self-referential symbols thus *also* enable scientific knowing. In this sense, Deely argues, "language" penetrates nature by using, not just models and methods, but also objectifications that draw on signs. These derive from, not just evolving lineages and ecosystems, Deely argues, but also from how "language" extends the mind dependent (*ens rationis*). In gleaning of a world beyond finite awareness, we do so without knowing what we are doing.

1.1. An ecolinguistics of languaging

Ecolinguistics is a critical challenge to classism and growthism (Halliday 1990) that seeks to clarify *interactions between a language and the ecology* (Haugen 1972). While ecolinguistics is flourishing (see, Stibbe 2015, Fill & Penz 2018, Steffensen & Cowley 2021), less is understood of how the ecology or, indeed, human living draws on languages. Most focus on correlating environmental harm (or good) with patterns of discourse (Steffensen & Fill 2015). To pursue how humans and languages shape extended ecologies, one can turn to how language is integrated with life and, thus, reunites social, sociocultural and cognitive ecologies (see, Steffensen & Fill 2015). Human living relies on *languaging* (see, Kravchenko 2018, Li *et al.* 2020, Cowley 2019a, Steffensen & Cowley 2021, Seiberth, this vol). Far from reducing to symbols, it arises as people use history to evoke empirical *wordings* by acting and perceiving. These patterned nonce events unite place, biology and action with constraints on what is said, thought, meant and done. As people enact experience, languaging shapes a common world (Cowley 2014, Steffensen & Cowley 2021) where what appears (for me, you and us) uses isomorphic features of activity. For example, as I eat a biscuit, I may think "coconut" (as an empirical wording). Taste triggers isomorphism-and-a-wording (viz. a never repeated event that indexes a linguistic type). Often, this happens even if nothing is said: the process relies on *picturing* (see, Seiberth, this vol.) or a wording event which connects with a repeatable pattern (and thus the domain of concepts). In Halliday's (1997) terms, a social semiotic (a lexicogrammatical system that includes *coconut*) contributes to semogenesis. Where picturings *are* overt (viz manifest construals of experience), the results enable the "things that are said" to be used in actualizing practices. Humans thus combine the results of semogenesis with coordinated activity. This is possible because we treat the results as signs that draw on history of semogenic effects (or what Halliday models as lexicogrammar). Hence this too can be described by semiotics –one needs only to *believe* in signs (or, indeed, to simulate such a belief).

Languaging occurs over the life span and, gradually, opens up fictions, contingencies and facts. These, I suggest, simply *are* the "above and beyond". Rather than posit a special ontology, signs arise as semogenesis contributes to engaging in the world. Over time, persons develop unique skills, experiences and kinds of expertise. Hence, other people, events and objects take on semiotic significance. Ecolinguistics becomes the study of languaging and its consequences[1]. As persons evoke conceptual structure,

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[1] *Ecolinguists* have turned to languaging recently; further, many who study languaging as situated human sign-making have a social focus and view themselves as "linguists" or "applied linguists".

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linguistic (and other) constraints are used to regulate activity in what becomes a world of practices. Humans sensitise to ritual and functional aspects of the common, world. Judgements link human saying-with-understanding: semogenic prompts permeate feeling, thinking and acting. People typically draw on social practices to co-orient to ways of perceiving and acting. Often, they come up with novelties and, in historical time practices change. Use can even be made of visualizing self-referential relations between patternings as with (x = x) or, if literate, how these can be resemiotised in careful "speech". An ecolinguist therefore highlights how people actualize practices by using objects and objectifications that, among other things, stabilize matters of fact.

Languaging combines the collective, ideational and material. The view is still seen as "unorthodox". Indeed, almost a hundred years after Vološinov's (2010/1925) critique of the post-Saussurian model, many still distiguish *language*, bodies and empirical "substance" (see, Cowley 2019b). Like philologists, linguists focus on text-like *abstracta* that echo De Saussure's *langue* and *parole*. They invoke "language-systems", "use", and "usage" where utterance events are taken to originate "in" an autonomous body, brain or mind (often, endowed with a language faculty). By contrast, an ecoliguist can see people as *porous beings* (Merleau-Ponty 1968: 196) or bodies that are lived and living. In pre-Enlightenment terms, this is how humans can draw on "languaging". In an influential work, Mulcaster (1582) writes how, when puzzled by Latin (or Greek), English school children turn to their "naturall tung": they use *languaging* to render sense out loud. Even today, may people give voice to what they see as unclear written text. They use languaging to enact understanding as a lived body draws on a person's doings in the world. As Seiberth (this vol.) shows, similar ideas lead Sellars to accord a transcendental role to languagings (viz. semogenesis as influenced by wordings). The results allow, he argues, for settling matters of fact that inform understanding, practices and, by extension, scientific method.

In parallel work, languaging enables people to become observers (Maturana 1978, Kravchenko 2011). While a bio-cognitive view highlights coordinations, the concept of languaging increasingly straddles once separate fields (Cowley 2019a). Given observing, languaging enables knowing that reaches beyond individual pictures of the world (and "sense-impressions"). If Sellars highlights matters of fact, languaging also enables idiosyncratic ways of writing (Juffermans 2015), lends sense to life in poetry (Ross 2018) and prompts advanced learners to new meaning making (see Swain & Lapkin 2011). The power of picturing grants creativity to translanguaging (Li 2017) and brings life to concrete poetry (Lee, in press). The view challenges not only the speaker bias (Andresen 2013) of philological and linguistic "explanations", but also theories that use code metaphors (Love 2004, Sperber & Wilson 1986). Indeed, the events of languaging merge cultural life with experiential particulars. Memorably, Becker (1991) writes: «There is no such thing as Language, only continual languaging, an activity of human beings in the world» (Becker 1991: 34). Echoing Heidegger, Becker stresses the pre-reflective, social practice and lived experience. In so doing, he also alludes to Wittgenstein's certainty and the play of aspects. Further, as Seiberth (this vol.) shows, Sellars's view of picturing the world traces languagings to, not statements or facts, but how, at a moment, lived bodies shape isomorphisms. Languagings are not wholly symbolic: in a hearing or a reading, one coordinates (or fails to coordinate) with how the said bears on the now. Even if grasped covertly, a wording changes understanding and, in time, may affect what one says and one's personhood. The same effects can be observed of both individuals and populations –we are changed by the linguistic aspect of events. Today, languaging is widely used in Applied Linguistics, sociolinguistics and unites distributed or systemic views of life, language and cognition. It informs understanding – expression shapes talk, listening, reading, writing, thinking etc. People

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rely on emplacement, not a language "system", as they bring past circumstances to bear on human practices:

> "Languaging" is a cover term for activities involving language: speaking, hearing (listening), writing, reading, "signing" and interpreting sign language. As recommended by Harris (1981 p. 36), it remedies the lack of a "specific superordinate verb which subsumes the common verbs to speak, to read, to write and to understand." As a general term it is preferable to "using language" or "language use" in not implying that what is used exists in advance of its use (Love 2017: 115).

Viewed from outside, languaging is «a matter of creatively endowing certain phenomena with semiotic significance in order to operate relevantly in the world» (Love 2017: 532). Once traced to the semogenic one finds two "orders" of pattern and activity (for Sellars, it is Janus faced). As in a chimpanzee's innovative solutions to novel problems (see, Bandini and Harrison 2020), first-order or sensorimotor activity enables attending and the co-control of eye and hand. Where languaging is overt, tongue and ears evoke public evaluations of wordings. Semogenesis grounds innovation as, in humans, material and historical constraints illuminate "things" and "situations". Unlike chimpanzees, humans can use a history of integrating individual techniques and experiences with familiar social practices. As they do so, wordings evoke the absent: lived bodies shape current and future behaviour around Love's (2004, 2017) *second-order* constructs or verbal patterns (Halliday's 2003 lexicogrammar). Literate communities map the patterns onto both phonetic gestures (as part of whole-body activity) and written marks as they index conceptual and other structures. As wordings gain significance, one observes, perceives and "fills in" as one "thinks" what one could/can say. The linguistic orders are symbiotic or bear two faces. Anything said, or potentially said, evokes pattern that, if overt, grants nonce activity a verbal aspect. As wordings, events also invite description (and analysis) as verbal types. As Vološinov (2015) saw, wordings are physical *and* verbal (or ideational)[2]. Languaging can be defined as: «activity in which (physical) wordings play a part» (Cowley 2014, Gahrn-Andersen 2021). It integrates lived activity, sensorimotor movement and ways of using "meaning potential" of verbal patterns. Given semogenesis, as Sellars (1960) saw, its outcomes can be one or all of wholly covert, imagined or overt.

2. The limits of science

Strings of DNA act as organic memories that bring knowing to living systems: they enable cells to self-fabricate (Barbieri 2018). Whilst "explicit" knowing is uniquely human, its basis is surely covert. Hence, philosophers and cognitive scientists turn to naturalism and invoke, for example, information processing, functionalism, computationalism, neo-Darwinian theory, enactivism etc. Given lack of consensus on how living systems can know, others turn to semiosis[3]. As Deely (2015) correctly recognises, scientific knowing builds on everyday objectification. How does this bear on the epistemic? While theories often appeal to a "mind", much the *de facto* knowing needs

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[2] While there are parallels with, say, legal use of "wordings", the senses are distinct. A lawyer's wordings are defined by legal context; in languaging, wordings link "contextual" factors with physical events (e.g. saccading at marks or how rhythmic repetition uses neurodynamics).

[3] I do not claim that this always occurs. Like Hoffmeyer, many biosemioticians invoke a semiotic ontology. However, Deely's distinction between objectified and non-objectified knowing also opens up middle way positions.

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no representation. This applies to cells, symbiotic relations, bioecologies or organism-environment coupling and, for a growing number, much or all human cognition (see, Chemero 2011). The view demands clear thinking about acts that render explicit. While variable, as in other species, the semogenic is enmeshed with what Ryle (2009) calls know-how.

Science links critical control of objectification with overt expression. The resulting practices attest to what Ziman (1978) calls *intersubjective verifiability*. Ways of objectifying knowledge, "referents" of propositions, endure across centuries. While Ziman's view is uncontroversial, for Deely, it is crucial that the ability to identify and judge "referents" cannot derive wholly from sense impressions. Scientific knowing also uses familiar and self-referential knowledge (i.e., as the idioscopic extends the cenoscopic). Everyday knowledge, which Deely ascribes to "symbols", uses various kinds of knowing. In principle it might use ether a semiotic ontology (and what Deely calls the *suprasubjective*) or picturings and how verbal patterns shape semogenic prompts. In any case, one important outcome is clear: science models only aspects of nature that can be subject to objectification[4].

2.1. Deely's challenge to objectivity

For Deely, objectification refines commonsense into what is mistakenly called "objective knowledge". He uses the idea to challenge what he regards as an error of solipsism. Rather than ask how languaging (or language) arises, he ascribes knowing to the results of a semiotic ontology. In Cobley's terms, he avoids an embarrassment of pluralisms or the «dissipation of language and cognition such that they are collapsed into their numerous locations and various functions» (Cobley 2019: 706). Intersubjective agreement about scientific models, methods and findings can suffice to reach beyond "sense-impressions". The problem is not solved by a brain (see § 3.2) that grants expressions "objective validity" (Craik 1943). While cognitivism posits a neural architecture that isolates semantic categories, viewed logically, the symbol grounding problem is either trivial or intractable (Harnad 1990, Belpaeme *et al.* 2009). Rather, signs provenate from beyond finite awareness that can grant correct judgements. Science uses "pure relations" to objectify what living beings know (who constitute *ens rationis* or mind dependent worlds). In all species, the known accumulates, to various extents, in what Deely calls "synchronous time" or, more transparently, a subject's life span. Living beings inhabit known Umwelten. Humans use self-referential "symbols" to derive practical knowledge by making use of language (viz. "symbols") which, of course, also contributes to the critical control required to identify scientific matters of fact.

Since one cannot demonstrate an ontology, Deely uses the intuition that explicit knowing is manifest as arrangements of "symbols". Like Chomsky (2006 [1969]), Hoffmeyer (1997), Sebeok (1998) and many others, he theorises "language" as both symbolic (in a specific sense) and also uniquely human. For Deely, the self-referential nature of linguistic symbols clarifies Maritain's (1970) claim that humans alone know that we know. Not only does this resonate with mediaeval views, but it also offers a striking counter to objectivism and mentalism. As knowing provenates from the suprasubjective, living conduits enable both symbol use and critical modes of control. Where objectification occurs, first, instruments and procedures objectify common sense: verbal and (related symbolic) expressions map onto findings and predictions. Second, self-reference can stabilise perduring relations between expression and

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[4] Conversely, one can argue that the history of English led *science* to be dominated by dangerously narrow sense (see, Cowley 2021).

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whatever-there-is (*ens realè*). Hence, humans, only humans, are able to access scientific knowledge. We are a «symbolic species» (Deacon 1997) and, as Ziman stresses, track patterns across the centuries. The necessary basis for knowing what it is that we know lies in symbols (e.g., words, language, diagrams etc.). A semiotic ontology overcomes the danger of solipsism by tracing knowing to modelling. For Deely, an epigenic break grants humans a second modelling system or, simply, "language" (viz. self-referential symbols). Given language, (in Deely's theoretical sense) scientific knowing consists in grasping "linguistic" models. It draws on symbols that disclose a mind independent nature. Humans are able to intuit the "suprasubjective" as, slowly, we come to know not only what we know but also knowing's limits.

Since scientific expression uses formal expression to extend everyday knowing, intersubjective agreement must also draw on these factors. It cannot be explained by appeal to sense impressions. For many, this negative argument is plausible or obvious. Yet, though many regard "language" as the mark of the human, there are others who are uncomfortable with Deely's post-modern ontology. In either case, two tenets hold: (1) objectification extends everyday observing; (2) given a basis in everyday knowing (whatever that is), the scope of science is limited. Although critical control (viz. scientific methods) objectifies aspects of nature, explicit results offer only one kind of knowing. Observations often defy symbolic expression or objectification. Like, say, theology, science relies on objectified observations. The view has striking consequences. For example, one can trace the environmental havoc wrought by science, in part, to our failure to acknowledge its narrow limits. Even if one rejects a semiotic ontology, objectifications, and critical control, build on the everyday. This has practical and ethical implications that can be taken to speak for an ecologically driven actional ethics (Cowley 2021). So, having stressed the narrow limits of science, let us turn to a deflationary alternative.

2.2. A wider view

A diagnosis of solipsism shows how narrowly we think of knowing. However, not all trace science to individual and/or sense impressions. In Science and Technology Studies (STS), for example, scientific knowledge is shown to draw on networks, human practices, equipment and so on (e.g., Woolgar 1991, Law *et al.* 2020). Even if Deely would claim that the emphasis eliminates neither appeal to solipsism nor the crucial role of signs, I take the turn to practices to offer a plausible alternative. In STS, scientific knowledge is intrinsic to networks of relations that unite experience of the observed, equipment, language, data and the textual. It enables collective way of using models and objectifications. From this perspective, Deely mistakenly traces objectification to individual experience of signs (and symbols). So, what are objectifications? To simplify, let us consider with how advertisers (and others) objectify human bodies. Often, as is well-known, they present them as "desirable" and, oddly, the results can make the beholder feel inadequate. In pursuing negative effects on mental health, Fredrickson and Roberts (1997) trace these to biases that inhere to social practices. In presenting bodies, the "eyes of others" link images to objectifications that trigger knowing something like "how I want to look". A person experiences «disengagement or alienation» (Marková 2012: 207) or a distancing akin to self-reference. This depends on what Marková calls a *social representation* or «the individual's rationalistic reification of an object or of another person» (ibid). Objectification meshes iindivdual experience with a socially-derived reifying or distancing effect. Images (and other factors) foreground "ideal" social norms. Rather as actual bodies differ from objectifications, scientific objects diverge from actual messiness. Hence, findings also use displays and social representations that make sense

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to people who are familiar with specific practices. Like advertisements, scientific "results" place reality at a distance. Of course, in meeting Ziman's (1978) criteria of *intersubjective verifiability*, these objectifications are *also* reliant on critical control. Unlike advertisements that rely on socially derived bias, scientific objectifications draw on practical criteria deemed to be rational. Investigations use standard methods and models together with reports and displays backed up by explicit argumentation.

Science uses measuring, transcription, computer modelling and other methods to create "clean" and organized data sets. Scrupulous use of practices has distancing effects. Although a truism that science idealises, one can ask how its objectifications link the actual with the expressed. As with advertisements, a display does not show *what a person identifies*. Rather, scientific results too invoke what Marková rightly calls rationalistic reification of the familiar. Hence, in grasping expression (and display), semogenesis is hooked onto a collective history. In construing results, self-referential symbols merely constrain our languaging. Indeed, not only is the expressed rich (featuring complex genres of test, illustrations and data), but body-world relations shape what a person identifies. As a result, scientific knowledge amalgamates multiple scalarites that grant experience and expertise. There may be no "pure relations"– objectifications link familiar cultural techniques, displays and an individual embodied history of using tongue, eyes, ears and texts. What we perceive uses social representations and, above all. how emplaced languaging (i.e., neural activity, facial expression, whole body movement and prosody) serves in actualizing practices such as reading. The distributed perspective constitutes a fourth position in the language sciences:

• Persons draw on ever reiterating coordinated activity whose embodiment links activity/perception with experience that, at times, has a verbal aspect (Cowley 2019b: 465)[5].

With exception for cases like sheepdogs and trained parrots, only humans perceive languaging as having *meaning*. But even these animals use physical occurrents as indices of pattern that contributes to managing sheep or echoing ways of vocalizing. Although languaging is always first order, wordings are *not* always perceived. With experience, even dogs and parrots use semogenesis to coordinate patterns of patterns. Yet, they do not treat the results as signs (e.g., tones of voice constructions, collocations) that, in themselves, serve to regulate attending and acting. Even if, the vocalizations as coordinative, animals lack the powers needed to use them to initiate action. For humans, of course, the patterned events *also* index conceptual structures, usage, and phonetic gestures. They rely on Sellars's picturing or, otherwise said, how aspects ("objects") can permeate *things*. First-order activity, or actual languaging, uses simplex tricks (Cowley & Gahrn-Andersen, in press) as, for example, ways of using heard patterns are brought to how and when we shift gaze or inhibit looking.

Deely rightly stresses that science relies on critical control. Yet, rather than highlight solipsism, I worry about a focus on propositions and, thus, neglect of how practices are actualized. It is striking that even Deely does not defend the solipsism claim but, rather, rejects appeal to sense impressions by asserting how knowledge accumulates for an individual ("synchonously"). He sidesteps how cultures, nonhuman actors and displays influence science. In STS (e.g., Law *et al.* 2020), by contrast, the world's messiness is

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[5] Other positions are: (1) Languages are verbal wholes whose lexical and grammatical features can be tracked in relation to changes in historical time; (2) A language-system (which may be social or psychological) enables people to use speech as the basis for other kinds of language use; (3) A language-system (or aggregate of constructions/ utterances) constitutes the verbal aspect of multimodal communication (see, Cowley 2019b: 463-464).

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seen as hard to reach. Human knowing arises as people bring order to the world. Not only can a focus on actualizing practices be used to oppose semiotic ontology, but it can also blind us to the limits of science (and the devastating consequences). While science extends knowing, it is important to ask how results, data, laws and findings are known. This is a collective issue and, as Cobley (2019) notes, opens up how animals and persons bring coherence to experience. One can ask how knowing engages a brain or mind to take a pluralist view of experience. Nonetheless, as is illustrated by Andy Clark, many chose versions of neurocentrism over pluralism:

> Human cognitive processing (sometimes) literally extends into the environment surrounding the organism. But the organism (and within the organism, the brain/CNS) remains the core and currently the most active element. Cognition is organism centered, even when it is not organism bound (Clark 2008:139).

Steffensen (2013) shows that linguistic observations defy organism-centred models. Everyday language uses interactivity or whole-body activity that includes ways of varying vocalization. While language activity can be *described* by words and sentences, as experience-in-movement it binds Love's two orders. Hence, usage changes both between and within persons. Linguistic novelties *spread* as we engage with things, persons, events and situations. Languaging depends on social practices that, in different ways at different times, draw on both public expressions and covert languagings. It needs no core, like life or cognition, it is distributed in space-time. Neither linguistic acts or construals are reducible to "processing"[6]. Organism centred views caricature a human as a symbol user whose knowing is derived from experience of sense impressions (viz., as autonomous or closed to other people and their experience). Indeed, this organism centred bias also features in a semiotic ontology that ascribes knowing, and judgements of verifiability, to a person. In rejecting processing, Deely reduces a lifetime of experience to a matter of coming to interpret signs. The semiotic ontology retains an organism centred perspective.

Organisms may inhabit a mouth, a pond, part of the savannah or, more precisely, they co-constitute a *bioecology* (Clements & Shelford 1939, Cowley 2014). Within multi-specific worlds (and Umwelten), lineages show varying degrees of flexibility[7]. Indeed, assumptions of organism-centred cognition are hard to reconcile with how co-existence changes over time. Living beings are adaptive, many learn and, in time, all must adapt perceiving and acting to a habitat. Coming to know is affected by contingences, interaction, environmental variation etc. or, in Wilson's (2004) sense, cognition is *wide*. In lions, play occurs and, in elephants, social learning co-evolves with cultural techniques. While the resulting "knowledge" can be *described* as semiotic "modelling", its many scalarities *are* coordinated acting (i.e., animals use contingencies, opportunities and perceived threats). A herd of elephants may find their way by using, say, both landmarks and long-distance signalling between groups (see, Ross 2019). Collective knowledge meshes with how environments prompt experienced animals to co-ordinate. While I return to elephants below, my point is that knowing arises *in* the world. In humans too,

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[6] In such models, even if learning, development and evolution are multi-scalar, the device treats analytical distinctions between discrete types as "real". In parameter-based models of mechanism, development, learning, experience and the contingencies of coordinating are treated as occurring in different "scales". There are, to my knowledge, no models of how they are integrated.

[7] In biosemiotics, many invoke a semiosphere or a domain of sign relations. To bring empirical features of the world into play, the semiotic and non-semiotic must co-occur. For the same reason a bioecology is a domain where an entanglement of species manages a changing modus vivendi (that draws on nonorganic factors).

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a habitat and its history ensure that, without being taught (or understanding how), by the emplaced use of norms affects a person's powers. Collective experience enables children to act as they orient to observable, public expression. Cultures not only objectify what they value (e.g., fertility gods, pots) but use the results in ways of acting that bring local standards to, for example, navigating (see, Hutchins 1995). In material engagement theory, Lambros Malafouris (2019) uses the case of pottery making to show how skills are both individual and bound up with cultural expertise. Elsewhere, I have traced the rise of languaging to a history of developing standards that demand the use of expectations while varying expression-in-action (see, Cowley & Kuhle 2020). From birth, or before, human knowing draws on culture and semogenetic sensitivity to norms –much more that what Deely terms sense impressions.

As cultural knowing, science too reaches beyond signs and senses. Objectification arises as social practices give rise to displays, semogenic prompts and languaging. One can ask about, not solipsism, but how expressive practices are actualised. Activity is emplaced, uses contingencies and, at once, how human knowing sensitises to norms. Expressions do not index (or represent) invariances but, rather, link conceptual structures with practical activity. Languaging can bind affect, ritual, use of artifacts and, in modern humans, literacy, institutional organization, money, production of goods and services etc. Emplaced activity uses historical constraints that contribute to objectification. While expression matters, languaging is integrated with action, matters of fact, and ways of picturing. Rather than posit a semiotic ontology, one trace semiotic description to a collective history.

3. Practices and collective living

Advertisers use attractive bodies to sell products and brands; objectifications fit images with biases, experience and/or training. Science relies on products that mix visual images, colour, mathematics, text and ways of re-evoking languaging (much is "symbolic"). In line with much work in the last century, Deely and Hoffmeyer take the linguistic turn. A focus on expression suggests that the self-referential function of symbols makes humans "special". Challenging appeal to sensory impressions, signs (and symbols) are said, mysteriously, to provenate from the suprasubjective. While one cannot refute such an ontology, one can prefer to ask how *belief* in signs emerges[8].

An evolutionary history of mammalian wide cognition may underpin belief in signs. As suggested above, lions and elephants use pre-linguistic semogenesis in behaviour like learning to play or coordinating the way finding of a herd. In primates, tool use fosters enskillment and, in hominins, the rise of practices led to material culture, institutions and languaging. With cultural techniques for creating objectifications, we came to draw on what have been termed social representations, distancing and both non-rational and rationalistic ways of engaging with the previously unknown. With science we granted great power to objectifications and especially displays where results can be expressed formally, tested by engineering and, within limits, reformulated symbolically (i.e., using writing systems). Indeed, in some cases, the outcomes are said to express natural laws.

Wide cognition can sustain beliefs in matters of fact which connect semogenesis with consistent use of wordings (viz. as parties coordinate attending, acting and perceiving). Human languaging has come to rely heavily on letters, digits and, indisputably, how self-referential symbols favour techniques like repeatability, recording, re-evocation and

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[8] One must accept/reject appeal to relations that are "over and above": the problem mirrors that of a representationalist theories of mind where symbol systems define knowing. In practice, it seems, both elude grounding in non-symbolic flux of a physical world.

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computation. Living bodies link experience (and displays) with objectified description (e.g., as verbal expressions). Human observers mesh the said with cultural use of artifacts, or as Gahrn-Andersen (2021) suggests, how enlanguaged cognition ensures that «things come with meanings attached». Much is gained from *belief* in words, meanings and signs. Consistency in usage connects expressions, practices and actions that invite evaluation of objective validity. Texts can bring pasts together with linguistic reflexivity. Languaging can co-evolve with expressions that transform human powers. Today these use alphabets, digits and other modes of presentation whose construal depends on self-referential properties (A is a).

• Writing systems enable repeatable phonetic gestures to covary with patternings (e.g., alphabetic forms) and the use of standardized conventions, styles and procedures.
• Standardizations contribute to literacy and simple arithmetic. Related practices serve their maintenance, standardization and extension as named languages and number systems.
• Named languages and number systems allow the writing of grammars, dictionaries, logics and codes that are back projected on languaging ground, say, telegraphy and computation.
• Computation uses physical symbol systems that allow for coding, data processing and media that draw on nonverbal digitization.
• Digitization grants new ways of controlling objectifying practices shape scientific knowledge.

Science unites practices, languaging and, increasingly, data that is stored and manipulated using of algorithims. In biology, for example, knowledge often pertains to what is learned from «model organisms» (Leonelli 2016). Here the issue is, not solipsism but, rather, how far social representations (e.g., what a model signifies) can be applied to actual living systems. Knowledge, including scientific knowledge, can only rely on the *already* observed. Even if traced to languaging and wide cognition, the scope of science is restricted to culturally delimited experience.

3.1. Incarnating practical knowledge

Individuals learn to take part in practices that use scientific expressions. Non-humans contribute to science as people draw on data and inscriptional material while performing practices in distributed systems. In Giere's (2004) terms, as «human cognitive agents», we extend our behavioural repertoire by adopting roles and procedures that make extensive use of scientific practices. Often these depend on how languaging uses what is rendered in print (or digital) form. One faces questions such as:

• How does interpretative choice making become part of a living body?
• How does vocal repetition draw on interpretative choice such that, in time, techniques with repeatable units are standardized, written and, later, digitised by physical symbol systems.

Interpretative processes maintain living entanglements (see, Favareau 2010) such that, as Markoš *et al.* (2009) suggest, life acts as its own designer. Its selection mechanisms begin with a "frozen" genetic code that enables metabolism (and homeostasis). Barbieri 's (2018) organic codes enable cells to use simplex tricks (see, Berthoz 2012, Gahrn-Andersen 2019) as engaging with the world prompts them to self-fabricate and co-construct as organisms. Cases like inhibition and vicariance (where one set of outcomes

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is replaced by another), lead to extraordinary switching, systemic re-use, and communication. While filtered by natural selection, systems register effects that can result in epigenetic change or symbioses (Markoš & Švorcova (2019). Systems adapt as they favour and/or suppress outcomes (see, Cowley & Gahrn-Andersen, in press). What humans *describe* as interpretative can arise as causal systems incarnate a multitude of scalarites (e.g., DiFrisco 2017).

In animals with a central nervous system, movements may trigger isomorphic responding that connects up scalarities as contingencies link perceptual systems, learned behaviour and action. In a setting, registered memories evoke neural resonance and action. Given such pre-linguistic semogenesis, behaviour can change how other individuals perceive as when, for example, woodland birds use audition in adapting to a changing soundscape (Farina & Pieretti 2015). In predators, wide cognition favours sensitivity to features of a changing habitat. Often this has epigenetic precedents such as when lion cubs use play in ways that ready them for later life:

> The cub paws a twig, then chews it. When another cub passes, he lunges and bites it in the lower back. It turns and swats, then walks away. The cub sits. Suddenly he stalks a cub and rushes. The one attacked rolls over with a snarl and both grapple. The cub desists in its attack and bites at a tuft of grass instead. He then flops on his side. After lying briefly on his back and waving his feet, he rolls over and watches other cubs play. One of these ambles closer. He crouches behind some grass, then rushes and swats and in the same motion turns to another cub and nips it in the flank (Schaller, 1972: 157).

A lion's experience alters them to otherness which, later, alters them to dangers. A hunt, for example, can be described as interpretative in that it relies in context-sensitivity, systemic co-function, vicariance and registered choices. A body uses systems and co-systems that use the already lived to shape ongoing experience. As a lion "sees" its prey, it integrates scalarities to seek out, move, gaze and look. At some moment, using pre-linguistic semogenesis, it will judge where and when to embed its jaws in the other. A lion's epigenetics unite experience, action and expertise.

Since lion interpretations are public, they can set off semogenic construals of experience. As one lion tracks a fellow hunter, isomorphisms allow some coordination. Yet, they show no evidence of co-orienting to what we call "signs". By contrast, elephants use semogenic norms or affective expression when, say, a member of the herd dies. They may carry the deceased, show defensive behaviour or exhibit distress by standing together with inactive trunks and a streaming temporal gland. This intimates emotion that can be likened to grieving (Goldenberg & Wittemyer 2020). Signalling and sensing draw on semogenic norms to bind individual life histories with a collective world. Tellingly, tool using primates use pre-linguistic semogenesis to gain skills (see, Cowley & Kuhle 2020). While some observing occurs, most learning arises from practice, mistakes and, developing techniques. Expertise in, say, nut-cracking becomes part of an individual and, remarkably, can take on a historical dimension (Falótico *et al.* 2019). Just as a group's techniques can improve, so do modes of self-enskillment. However, the best-known pre-linguistic semogenesis appears in how, 100 years ago, Koehler's (1925) chimpanzees solved problems with displays of "insight". Without language, they used derived expertise to generate novel outcomes. Such know-how needs no explicit *knowledge* of what a body is able to do.

What of vocal *construal?* First, as with nut-cracking, vocalizations mesh human perceiving-and-acting with normative patterns (i.e., from aah and ooh to a linguist's *language system*). Even new-born infants identify culturally specific rhythms (see, Nazzi *et*

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al. 1998, Suppanen *et al.* (2019) and, as with nut cracking, use the tongue as a social tool Oller 2000, Oller *et al.* 2019, Cowley and Kuhle 2020). Skills emerge slowly, build on mistakes and, as Bottineau (2012) argues, integrate group specific patterns (e.g., of sub-morphology) with techniques of vocalizing-and-perceiving ("overt languagings"). Without knowing what they are doing, infants babble and attune to speech (e.g., using a perceptual magnet effect (Kuhl 1991, Stern 2020). As they construe experience, they use vocal semogenesis (i.e., experience based isomorphisms trigger "covert languagings"). Such context-sensitivity opens up normative ways of concerting action as, like other tool users, they register techniques. In time, they actualize community practices by binding vicariant use of lexicogrammatical into social ways of using material engagement.

In the first 12 months, modern human babies use interpretative choices based on meshing local vocal patterns with action (Tomasello 1999, Cowley 2007). They come to treat objects as *things* or, in Sellars's terms, produce overt languagings that arise without belief in wordings (as types). Indeed, as Maturana (1978), Kravchenko (2007, 2011) and others show, languaging can be seen as an unending flow of recursively coordinated activity. Although such evidence hightlights the "pre-linguistic", no more is needed for wordings. As with material engagement (Malafouris 2019), learning to talk can build on bodily engagement. Strikingly, this is akin to how Markoš and Švorcova (2019) trace (synchronous) living across scalarities: hardwired solutions co-function with adaptations in bioecologies. The logic of multi-scalar cognition reappears in pottery making where expertise draws on normative prompts set off by contingencies. Enactive signification, a changing sense of what to do, shapes action. Is uttering, say, *duudduudu* or *mamma* based on self-reference? It seems more like enactive signification. A caregiver, for example, may sets off an isomorphism: an infant might even evoke her with a syllabic pattern. Talk, pottery making, and other highly skilled activity all seem to draw on a changing sense of what to do. Far from learning nor acquiring self-reference, routine ways of languaging may arise from using enactive signification together with techniques based on treating utterances as utterances of something (skills build on a «language stance» (Cowley 2011).

Like lions or elephants, humans use contingencies, the familiar and semogenic prompts. These mesh wordings, experience, techniques, materials and products. Pottery making, for example, changed with the potter's wheel and, in time, use of regular, decorated objects. Hence, while all societies use ritual, once made visible, language invites analysis (see, Olson 2016, Trybulec 2021). It becomes potentially symbolic as consistent roles come to covary with forms (sentential, phonological and morphosyntactic), functions (propositional, semantic) and actions (pragmatics, speech acts etc.). Such analyses inform religion, law and, of course, science. Their basis lies, I suggest, in fine tongue control and a semogenic repertoire. Covert languagings prompt the imagined (if wordings are unspoken) and, at other times, overt verbal expression. Once subject to how action uses normative criteria, the results permit inscriptional recording. As they gradually become symbolic, they enable signing, logics, the use of codes and programs. The symbols of science use a history of literacy and, in a world of texts, *establish* abstract realms. Signs may be collectively "projected" onto what some picture as an ontologically distinct *ens reale*.

3.2. Objectification revisited

Wide cognition allows languaging to extend control over bodily substrata that favour primate tool use. Fine tongue control transforms semogenesis as bodies attune to practices, act, inhibit and manage vicariance (and simplex tricks). In literate humans,

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covert languaging emerges as endophasia (Bottineau 2012). As Sebeok, Chomsky and others argue, one should not exaggerate the social and communicative role of the verbal. Rather, as in dance and music, prosody and affect (see, Dumouchel 2002) influence bodily coordination and languaging. A history of ritual and object-making enacts everyday objectification. Humans use social criteria to see "through the eyes of others" by meshing languaging with other displays. While objectification began with natural objects, artfact-making and rituals, inscriptions trigger beliefs in more abstract objects. These include kinds of bodies, gods, languages and, of course, money, institutions and organizations. Humans discover laws, religion and all the "abstracta" of science. Hence, semogenic activity uses virtual objectifications extensively. As Becker (1991) saw, "Language" exists –through the continual languaging of human beings in the world.

Science is restricted by critical control of objectification. The view is shared by ecolinguists and is, I stress, important. However, wary as I am of a semiotic ontology, I suggest that languaging draws on how multiple scalarities contribute to material engagement. Semogenic processes bring normative criteria to bodies and their extensions. Given the human tongue tool, material engagement co-evolves with cultures and languaging. We perceive through the eyes of others – whether making objects and/or using signs. The latter grant us fertility gods, words, advertisements, and scientific abstracta. All rely on how distanced presentation shapes the perceiving of others. Any "greater whole" or suprasubjective relations result from collective projection (and belief in signs). Biosemiotics does not "explain" but, rather, enables constructive description. In culturally extended primates, it permits emplaced and formal ways of knowledge making. In, say, vaccinology, objectifications are a necessary in designing tools that enable an immune system to respond to, and remember, pathogen antigens. Medical intervention changes viruses, the vaccinated and bioecologies. Yet, knowledge is limited – a gap separates vaccinology from immunology (Pollard & Bijker 2020). Little is known of living systems, bioecologies or living human beings. Languaging does not reduce to self-referential symbols and, even where these are engineered (e.g., as digits, letter shapes or fonts), they function through objectifications (e.g., texts, languages, disciplinary frames).

4. A humble conclusion

Humpty Dumpty links belief in words with an epistemic conception of mind. By claiming that "words" mean as he chooses, he aims to master knowledge by using signs. In deflating semiotic ontology, I join those who think he is mistaken. Special effects arise as objectifications evoke collective *belief* in words. Languaging binds what a person can describe, action, and to collectively controlled potentials. With belief in signs (and words), knowing changes. Pre-linguistic semogenesis altered as hominins linked its actional promptings with material engagement, voices, and ways of using historically constrained social dynamics. Thus, whereas Deely traces knowledge to signs, I stress physical wordings that evoke social representations or, roughly, what Halliday calls lexicogrammar. A semogenic history sustains languaging as *activity in which (physical) wordings play a part*. Though science indeed extends older ways of knowing, Deely is wrong about solipsism. Science relies on objectifications that connect practices, material engagement, and how activity uses semogenesis.

Expressions and engineering extend powers based on integrating fine control of the tongue with sensorimotor perception. Virtual structures are used in making objects as diverse as pots, advertisements, wordings and scientific instruments. While objectifications rely on perceiving "things", the eyes of others (i.e., social representations) serve to project abstracta. Human voices open up facts, values and, as

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shown above, ways of describing the "knowing" of lions, elephants and immune systems. Hence, semogenesis clarifies *interactions between languages and the ecology* (Haugen 1972). Languagings arise as isomorphic relations bind wordings, perceiving and acting. The scalarities of "enactive signification" prompt humans as they engage with bodies and materials. Like lions, elephants or chimpanzees, we sensitise to domains beyond the body. With fine control of tongues and hands, we coordinate artifice, voices, and ways of engaging in social settings. As with other practices, science uses wordings and how, together, people change themselves and their habitats. We believe in, not only signs, but also what objectifications suggest (e.g., perfect bodies, institutions, models and machines).

Since science is limited by what can be said, critical control omits the world's messiness. Unexplored aspects of the adjacent possible are left out of findings. Hence, to work for all our futures, as Cobley (2016) suggests, ethics must not be paralysed by general principles but, rather, must respond to events. For example, during the SARS-CoV-2 pandemic, just consumption adjusted, vaccine design tapped into scientific objectifications. An imagined "normal" enabled the powerful to draw on an actional ethics to alter patterns of human life. Similarly concerted action may yet serve to reverse climate change. Yet, words and signs merely subtend models that, in themselves, grant science no moral power. A sense of natural inclusion (Rayner 2018) or bioecological awareness enables ecosystemic degradation to bring about action. It *matters* that science only links facts, belief in signs and what is currently said. Since observations lack ethical import, action demands stories (Stibbe 2015). In order to rebalance the biosphere, we need to tell each other how bioecologies bind people, languaging and local knowledge. Using the eyes of others, ecolinguists, semioticians and many besides can act to change science, how we live, and the adjacent possible. One story that power can be made to hear is that of how ways of knowing, including science, can be used to found ecocivilizations.

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