

Generativity in biology

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Published online: 18 May 2013
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Abstract The behavior of an organism, according to Merleau-Ponty, lays out a milieu through which significant phenomena of varying degrees of optimality elicit adjustment. This leads to the dialectical co-emergence of milieu and aptitude that is both the product and the condition of life. What is present as a norm soliciting optimization is species-specific, but it also depends on the needs of the organism and its prior experience. Although a rich entry point into biological phenomenology, Merleau-Ponty's work does not adequately describe milieu–aptitude development in interactions between organisms, but it can be assisted through employing Husserl's three levels of analysis identified by Steinbock, extending all three modes into the biological world. In particular, generative analyses can address inter-organismal behavioral structures slighted in Merleau-Ponty's work. Generative phenomenology is concerned with the cultural, historical, and inter-subjective constitution of human experience and is generally thought to be solely of value in examining the structure of human phenomenality. However, the possibility of human generativity presupposes structures produced widely in the biological world. Ecological, embryogenic, and evolutionary development already depend on protocultural and historical processes creating and created through intercorporeal interaction. After developing the concept of *biological generativity* through a consideration of plant ecology, mammalian embryology, and insect mimicry, I conclude with implications for humans, who can participate in biological generativity not merely phenomenally, but phenomenologically.

Keywords Generative phenomenology · Phenomenology of life · Autopoiesis · Ecology · Umwelt · Merleau-Ponty · Steinbock · Husserl

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Introduction

Early in his career, Merleau-Ponty (1963) provided an important analysis of behavior in biological organisms. For Merleau-Ponty, organisms maintain their form by constituting milieus that elicit preferred behavior. “Preferred behaviors” reestablish preferred relations with what appears as significant in the milieu. Thompson (2007, p. 74) explains that “organisms shape the physicochemical environment into a milieu (an *Umwelt*). A milieu, from the standpoint of what is present and real at the physicochemical level, is virtual, something needing to be actualized, and actualized moreover at another level, the level of *vital norms* and *meaning*.” A milieu is transcendental in a twofold sense: It is not merely the a priori conditions for the possibility of experience in an epistemological sense. It is also the a priori conditions for the possibility of the form of the organism. The forms of life depend on a structure of behavior that casts a web of signification and valence onto the world, a milieu dynamically constructing and constructed by the motor and perceptual possibilities of the organism.

For Merleau-Ponty (1963, p. 161), the general structure of behavior is such that the milieu and the aptitudes of the organism are two poles of a single phenomena. General situations emerge with general aptitudes. Both the organism’s sensory and motor worlds are connected “in a chain of reciprocal determinations” (p. 50). As such, the “organism itself poses the conditions of its own equilibrium” (p. 150), maintaining a “vital” and not a “physical equilibrium” (p. 147).

The structure of behavior is “expressed by certain constants of conduct, of sensible and motor thresholds, of affectivity, of temperature, of blood pressure,” etc. (p. 148). Although the expression is species-specific, behavior is not strictly a series of repeating patterns that permits comprehensive cataloguing. The system is open. The actual world out of which the milieu–organism dialectic takes shape impinges constantly on behavior. Although the manner in which such perturbations appear in the milieu is established by the structure of behavior, novelty continually demands recalibration. As such, even in the simplest organisms, the organism’s activities and the milieu it discloses are continuously readjusted. An organism and its milieu co-constitute one another, setting boundaries for what experience is possible, while experience plays a role in shifting those boundaries.

Static, genetic, and generative milieus

Merleau-Ponty provides a bridge between phenomenology and biology, but his structure of behavior is limited to nonsocial and, in that sense, acontextual descriptions of the emergence of biological signification. We can extend our understanding of the phenomenality of life through the three interconnected levels of analysis that Steinbock (1995, 2003) identifies in Husserl. These are “static,” “genetic,” and “generative” analyses.

Husserl called his first form of analysis “static phenomenology,” and through it, he explored the unchanging structures of experience, such as the structure of intentionality. At this level of analysis, a living being appears to have a set of ways of disclosing its milieu fixed in accordance with the limitations of the organism. A

living being has vital norms instituted in virtual relations, but they are seen as adjusting behavior without themselves being adjustable. Much of Uexküll's work (1926, 2010) can be seen as attempting to forge static analyses of organism's milieus based on species-specific sensorimotor possibilities.

Genetic¹ description goes beyond this because it is fundamentally concerned with the way an organism's milieu is actualized spatiotemporally. The dynamic co-constitution of a changing organism in a changing milieu cannot be described by simply delineating the invariant structures of experience. It must be re-seen as "a process of becoming in which [an organism's] present experiences point back to previous ones, having become sedimented as habitualities and predisposing [it] to other typical future acquisitions" (Steinbock 1995, pp. 57–58). By entertaining this level of description in our consideration of other species, we can go beyond understanding them as having fixed milieus and acknowledge that, in contrast to Heidegger's (1995) claim, all living beings are "world-forming." Merleau-Ponty's (1963) analysis of amovable forms in the *Structure of Behavior* is an attempt to extend genetic analysis to the animal world, where the structure of an organism's behavior permits temporal evolution via the dynamic relationship between a milieu pole and an aptitude pole. A living being is oriented to the virtual, but there is a development and changeability as to *what* is virtual and *how* the virtual elicits responses over time.

However, the genetic level of analysis is not sufficient to consider the behavior of even the most basic creatures. The norms that a living being attunes to can also be affected by the norms of other living beings with whom it interacts. Living things are "sensing and sensible at every moment" (Merleau-Ponty and Séglaard 2003, p. 273); they continuously interact and intertwine through intercorporeal contact. In so doing, novel spatiotemporal dynamics occur that extend well beyond the organism and yet feed back to impress upon the organism's subsequent disclosure of its milieu. Generative phenomenology is said to be concerned with the cultural, historical, and intersubjective constitution of human experience, but these terms have biological analogs that play an actualizing role in the structuring of almost every organism's milieu. It makes sense to talk of intercorporeal, sense-making beings in terms of generativity even if they themselves are not able to conceive of it in these terms. In proposing this analysis, my purpose is not to level out or diminish the particularity of the phenomenality of human experience, but to situate it biologically. Likewise, although Steinbock identifies the co-emergence of homeworld and alienworld as the core phenomena in generative phenomenology and stresses how the experience of birth and death are manifested generatively, the absence of these or any other particular dialectic in other species does not indicate a lack of generative constitution of nonhuman milieus.

Cultural, historical, and intersubjective constitution of the organism's milieu

Lest the move to conceive biology generatively be seen as brazen anthropomorphism, let me address the issue head-on in this section. The concepts "cultural," "historical,"

¹ The use of this term in this paper is phenomenological and does not refer to the field of genetics in the life sciences.

and “intersubjective” should be considered broadly enough that their role as biological preconditions for human culture be evident. These terms can help reveal what biological structures and relationships need to already be in place in some formal way within the biosphere for the possibility of what is uniquely human to emerge. All three terms have precursors in the biological world, where they are as interconnected and as indissoluble as they are in the human world. Steps toward generativity were made long before the human arrival on the planet, although it is certain that fundamental “differences of integration” (Merleau-Ponty 1963, p. 133) make possible different formal possibilities in what is realized across different species.

Intersubjectivity is required for both culture and history, so it will be addressed first. Intersubjectivity can be thought of as the form of behavior that occurs when an organism is “structurally open to the other in advance of any actual encounter” (Thompson 2007, p. 383). Trevarthen (1979) made an important conceptual distinction in analyzing the emergence of intersubjectivity in infants. By differentiating between “primary intersubjectivity” and “secondary intersubjectivity,” he was able to encompass the infants’ perceptual responsiveness to others, which had otherwise been poorly represented by notions that intersubjectivity necessarily involves an awareness of other subjects *as* subjects in one’s experience. Instead, primary intersubjectivity was a more embodied concept, appearing as a heightened responsiveness, attention, and capacity to co-regulate with other humans. The other human infiltrates the infant’s experience unlike any inanimate object *without* appearing as an ego or a subject and is a structural precondition for any behavior that might lead to “secondary” intersubjectivity. Co-regulation of visual and vocal patterns, gestures, and body movements all suggest a fundamental structural openness of the infant to his or her caregivers.

As will be shown, the affinity and discriminate capacity to respond to specific others is widespread across the biological world. For now, readers should consider flocks of starling flying in the evening sky, choruses of grasshoppers at dusk, or a pack of wolves coordinating their hunt, as particularly vivid examples of what should be labeled “primary intersubjectivity” in the animal kingdom. Primary intersubjectivity is important because it creates orders of signification (and, therefore, forms of complexity) not possible in inanimate–inanimate or animate–inanimate interactions. There is surely a gradient of awareness from systems, such as adult humans, where secondary intersubjectivity is well-developed to creatures (such as, perhaps, quorum-sensing bacteria) who have no sense at all of other sense-making beings *as such*. Regardless, in all cases, the disclosure of a milieu is constituted non-solipsistically because the other is already affirmed through the interactive role it plays in co-constituting behavior. We do not need a recognition of the existence of others in the actualization of experience in order for others to have a role in this actualization. But we do need that role to exist in order to become aware of it.

Primary intersubjectivity, especially in its forms most remote from the human experience, could be called “intercorporeality.” Some might prefer to reserve the term “intersubjectivity” for organisms that are subjects in a narrower sense. This is fine, as long as it is recognized that the interacting bodies are not merely bodies in a physiological sense, but poles in an organism–milieu pole that has some degree of openness to the world and, in particular, to certain other bodies in that world. I prefer the word “subjectivity” because it evokes more effectively the intentional structure of the organism and will continue to use such terms here.

Through various forms of feedback in large communicative networks, primary intersubjectivity can also give rise to a process of proto-enculturation. This is not an anthropomorphic blotting of human categories onto the rest of the biological world. It is an excavation of the patterns of interactivity that are already in place such that reflexive, symbolically mediated semiosis, and other human activities emerge in cultural systems without saltatory discontinuity. If something like culture can be said to exist in other organisms, we must not look for aspects particular to (certain elements of) human culture. This is an injustice both to other species and to the range of phenomena present in human experience. Humans in a population learn from each other such that they co-constitute certain patterns of behavior that provide the context for future interactions in the world. A human milieu is, from the beginning, shaped by parameters set by learning, experience, and communication with other humans. Human cultures propagate via multimodal semiotic communication pathways and not merely by symbolic and linguistic transmission, all of which depend on an intertwining and intergenerational transactional network that need not be transmitting messages of any particular sign type. It is this behavioral structure that is already present and constitutively significant across the living world.

As primary intersubjectivity blossoms into vaster networks of co-regulating organisms, a temporal dimension exceeding an individual life span also obtains. Historicity is, therefore, already present across a multitude of temporal and spatial scales in the biological world. Husserl said that historical time spans generations, and so, culture distinguishes humans from other species because an animal (for example) “merely repeats its specific environing-world with the peculiar typicality of its particular species” (Steinbock 1995, p. 198). However, this argument seems to adopt the prominent Uexküllian biases of continental thought at the time. Uexküll argued that the experiential world of an organism is strictly determined by the type of perception and action cycles that its bodily constitution makes possible. He failed to make explicit how perception–action cycles open the organism to novelty. Whatever “learning” was possible was, in a sense, merely fulfilling the prescribed developmental outcome of perception and action. Biosemioticians and philosophers of biology following this avenue are likewise committing themselves to “static” analyses. Doing so risks passing over much of the richness, but also the indeterminacy, of the phenomena. Darwin is often attributed with providing logic that rendered biology a historical science. However, biology can now to be seen as historical in a stronger, phenomenological sense: the milieu of a particular organism is disclosed in such a way that it indeed reflects the “nature of the times.”

Biological generativity on three scales

Biological generativity, the core structural precondition for any human generativity, is present across a vast range of biological phenomena. Here I will review three different scales (ecological, embryological, and evolutionary generativity) to examine in what ways the phenomena considered must be understood as grounded in more complex structures of behavior than are admitted in merely static or genetic analyses.

Ecological generativity

The relationship between an organism and what it discloses as norms requiring optimization can be viewed statically, genetically, and generatively by considering common plant behavior. The plant² discloses virtual properties in the world as meaningful and acts towards them in ways that only make sense on the formal level of their lives. Consider a root seeking out and exploiting an area in the soil where there is a high concentration of soluble phosphorous. The attraction is not chemical, gravitational, or magnetic. The trophism can only be explained by the fact that the plant has a phosphorous level that requires optimizing. Its form discloses a milieu that presents such signification. Phosphorous' attractiveness is explicable only with reference to the virtual value it has in how it is "seen" by the plant.

If we consider the plant's disclosure of phosphorous in its milieu and posit the structures necessary for this to occur, we are maintaining a "static" perspective. However, since the plant changes its responses over time, its milieu also actualized genetically. For example, in foraging for rare nutrients, root morphology changes when a plant comes across a soil patch with a high nutrient density (Hutchings and John 2004). In the latter case, denser, more lateralized branching occurs. The milieu is no longer disclosed as a place in which the plant has to seek widely for needed nutriment. The milieu has a new structure that corresponds to what the plant discloses as significant, given the norms that now need optimizing. The physiognomy of its behavior is exhibited in the phenotypically plastic roots and the particular trajectory that they have forwarded.

The plants' behavior can be further illuminated using a generative analysis because the way it unfolds its milieu is affected by its history of interactions with other plants and other species. For example, many plant species develop symbiotic relationships with mycorrhizal fungi who forage for difficult nutrients in exchange for sugars provided from the plant. Both the fungi and the plant learn from each other and the subsequent behavior of each is informed by the evolving way each appear to the other in each's respective milieus. For the plant, the desirability of phosphorous can be radically altered by its ease of availability and the plant can put energy into new limiting resources (according to Liebig's Law of the Minimum; Paris 1992). Some plants do not associate with mycorrhiza as well as others, and the behavior of both the plant and the fungi will depend on this. The milieu of the plant depends on its ecological situatedness, but in turn affects the community around it through the plant behavior it solicits.

² Uexküll (2010, p. 146) doubted that plants have *Umwelten*. He wrote that plants do not have perceptual or effector organs, therefore, not carriers of meaning, and hence, do not have functional cycles. Instead of meaning circulating as an organism perceives a world, acts on it, and re-perceives the changed world, plants produce meaning solely by the selection of stimuli from the outer environment on their "dwelling shells" (*Wohnhülle*). However, the conception of a plant as having fixed responses and, hence, fixed meanings without internal coordination or synthesis has been outdated in light of contemporary studies on plant learning and behavior (Trewavas 2003, 2009; Affifi 2013). Kalevi Kull (2000) argues that plants must now be seen as also having a functional cycle with meaning cycling evolving through the iterations of the plant constituting its milieu. The more important question regarding plants is how and where milieu constitution arises and to what extent the plant's functional cycles can be thought of as whole-organism activities or merely modular and localized. In any case, the presence of functional cycles, movement, memory, categorization, and learning in plants suggests that Uexküll's (and Jonas') intuitions regarding plants reflected his own lack of study into them and that many of the phenomenological insights that he carried over into the animal world can in fact now be considered in plants (and/or in parts of plants).

Husserl's "genetic turn" involves a description of how habits emerge through the abnormal becoming normal within the individual (Steinbock 2003, p. 293). In a generative context, normalizing occurs in the interactive domain of intersubjective interaction. From a generative perspective, organisms are now seen as affected by and contributing to the establishment of norms outside of themselves: we can "*generate* beyond [ourselves] a new 'concrete teleological sense' and thus a new normality and a new telos" (p. 293, emphasis in original). A plant's behavior affects its community and to its descendants in the phenomena of "signaling cascades," which can produce localized norms of behavior that are triggered and retriggered among plant communities through varied forms of signaling. In this way, the behavioral repertoire manifested through phenotypic modifications spreads and is reentrant back into the evolving milieu of the plant. This sort of phytoculture can have significant implications for the composition of the ecological community, as when signals that communicate the need to produce toxic allelochemicals are spread across plants in response to herbivory (Karban 2008). For example, plant-produced allelochemicals can increase the susceptibility of insects to infection and disease while in turn diminishing the effectiveness of entomopathogens in killing their hosts (Cory and Hoover 2006). Signaling cascades within plant communities can potentially make these interactions population-wide, significantly altering the structure and dynamics of ecological systems. Much more research is required in plant population ecology to assess the ecological relevance and extent of this behavior.

As Steinbock notes, static phenomenology need not be the starting point for all investigation, passing through a series of "leading clues" (*Leitfaden*) beyond itself into the genetic and eventually the generative dimensions. Rather, all three dimensions are continuously present and are better understood on a spectrum from the static, which is abstract, to the concrete, which is generative. This inverts Husserl's original perspective that the static was the most concrete and, therefore, the obvious starting point. By contrast, Steinbock (and Husserl in his later years) realized that to isolate the specific from what it is embedded in is to decontextualize it, which is an abstraction. But the abstraction (just like the perception-laden physicochemical abstraction for Merleau-Ponty), never fully rids itself of the formative constitutivity of the concrete dimension from which the abstraction became possible.

In ecological terms, we can understand that the individual and the ecosystem do reciprocally determine one another and that this process is generative, while at the same time recognizing that the reciprocity is asymmetrical. Hence, just as the organism and its parts co-constitute one another autopoietically, but there is ontological primacy in the organism for the possibility of the exchange to occur at all (Thompson 2007, p. 79), the generative capacity of ecological communities is what grounds the possibility of the individual (and, therefore, static and genetic modalities). According to Steinbock (2003, p. 316), when we go from the generative context back to the individual, we go back to the individual as situated in an essential "cultural and historical tradition." Genetic and static lenses can be reapplied, but with an awareness of their larger hermeneutic nesting.

When a plant changes its behavior as a result of a signaling cascade brought on by surrounding plants in its community, its subsequent disclosing of a milieu is colored

by signals received from other plants. For example, plants often communicate news of predator attacks through volatile organic compounds (VOCs) to other plants. While the other plants may not directly experience the presence of the attacking insect, their sensory behavior and internal signaling systems are modified by the news. Behavioral changes are the physiognomic indication of interior changes of experience. In the case of their following suit in releasing VOCs, there is an identity between the internal state, its physiognomic expression, and its expressive capacity to other living beings. There is a structural equivalent of a “face” in a plant’s release of, say, methyl jasmonate or some other common communicative compound. Botanical sciences can, therefore, provide important leading clues for phenomenological studies into plants and the range of possible explorations of continuity among the living.

That dialects of behavior evolve in animal species has been quite well-documented in the songs of birds and whales and in the use of tools in primates. I refer the reader to Avital and Jablonka’s (2000) *Animal Traditions* to explore the realm of living expression and how widespread phenotypic inheritance is within nonhuman animal communities.

Finally, we can expect that the establishment of stable sets of relations between organisms, such as occur during the construction and continuance of ecological niches (Odling-Smee et al. 2003) will give rise to “normal” geohistorical communities, where interactions are based on familiarity and shared expectation. In keeping with Husserl’s discussion of the larger cultural constitution of the homeworld, there is a biological correlative that is similarly dependent on regulation and differentiation that occurs over larger spans than the individual organism’s life. A niche is a milieu that is constituted through the interaction of multiple, milieu-constituting living beings. To use a Husserlian expression, the organism “appropriates (*übernahme*) sense” (Steinbock 1995, p. 61) that stems from the world of form that its ecological community actualizes.

Embryogenic generativity

An embryo is made up of individual cells that maintain increasingly specific relationships with one another as development progresses. Initially, we can only speak of cellular milieus. Though Merleau-Ponty and Séglaard (2003, p. 167) was not explicit about this, he did say “we must allow for an *Umwelt* at the level of the organ.” Uexküll (2010, p. 47), however, is bolder on this account: “every living cell is a machine operator [possessing] its own particular (specific) perceptive signs and impulses.” Before there is strong integration, the primary sensory, motor, and cognitive activity within the embryo is occurring in the individual cells themselves and development is quite decentralized. Gradually, “behavior develops across the whole of the body ... [and] the parts of the organism acquire an existence ... in the very order in which they are invaded by the total pattern” (Merleau-Ponty and Séglaard 2003, p. 145). The multicellular unity of the cells comes to form what Maturana and Varela have called a “second-order autopoietic system” (Thompson 2007, p. 105). At this point, there is a higher-order centralization that accumulates sensorimotor percepts and cognitive information from the individual cells and synthesizes whole-body information from it. However, it is not a linear system, but a recursive one. While the varied sensorimotor percepts are combined, the interpretive meaning in the whole

body directs the bodies' parts into the world to further the meaning construction of the whole. Individual cells and organs are enlisted to serve the whole body in its constituting a milieu. This does not mean that the individual cells no longer have percepts, functional cycles, or milieus. It is simply that the milieus that they realize are within a larger body, which means that its sensorimotor possibilities are funneled (and utilized) by its situatedness.

In terms of embryogenesis, there are two related problems, each which can be reexamined through a consideration of generativity. The first concerns the possibility of the emergence of intercellular organization in dividing cells. The second is the seeming fittedness of the whole to future environments. In the first case, the individual cells are being organized spatiotemporally and the question remains how this is possible. In the second case, the emerging organism is found to be structured for an anticipated spatiotemporal relationship without it being clear how such future-directedness can be a part of a co-emergence theory. I will approach the second concern in the next section in my discussion of mimicry, but will explore the first concern now.

Consider the fertilized mammalian egg cell. During initial embryonic cell division, known as cleavage, cells are undifferentiated and have the potential to become any future kind of cell. At this point, they are known as having *totipotentiality*. However, totipotentiality is quickly lost. Different cells switch off different genes, eventually giving rise to specific cell types, such as liver cells or white blood cells or brain cells. How is this differentiation achieved? Embryologists maintain that there are at least two factors essential to creating differentiation. The first is the polarity of the mammalian egg cell. The second is the duplicating cells' ability to organize in relation to this polarity, cued by both cell–cell contacts and cell–extracellular protoplasm contacts (Drubin and Nelson 1996). For example, mammalian cell differentiation often occurs through communication between cells using *transforming growth factor β* , which is used by cells for signaling to nearby cells. Intercellular dynamics quickly proceed “in ‘cascades’ of sequential inductions and ‘networks’ of multiple influences” (Oyama 2000, p. 146; Raff and Kaufman 1983). As the various cells organize themselves in relation to virtual norms (such as signals) and develop, both the norms and the polarized form becomes further established and particularized by the very activity of the cells.

By considering the cell in isolation, we are remaining in static and genetic analytical modes. Many of the chemicals used to mediate intercellular communication are already being used intracrinally and autocrinally, so from a cell-centric perspective, what is called signaling can usually be understood as an activity of an autopoietic cell's functional cycling. As the cell acts and responds to its milieu, there is a dynamic co-emergence between its own bodily development and the external conditions to which it can respond. Although the meaning of the relationality of intercellular behavior is lost, even through static and genetic descriptions knowledge emerges that is inaccessible to cell biology that does not consider unicellular milieus as a part of the actualization of cell behavior.

However, the loss of totipotentiality during early embryological development is actually a leading clue for recognition of historically constituted milieus throughout the interaction of embryonic cells, both between themselves and with their mother's body. Whatever the individual cells' receptors and effectors are capable of realizing is

dependent on the development of their own internal constitution, but their own internality is itself realized through the larger “geohistorical” situatedness that the cell finds itself. While the scale and time span seem small from our perspective, cell differentiation is a vast, multigenerational activity accumulating phenotypic changes through regulating modifications in DNA activity. “Normal” and “abnormal” (and, hence, perception and signaling) become established through intercellular activity and cell cytoplasmic activity. These are embryo-cultural effects.

Endogenous cellular interactions can provide important insights into the ubiquity of generative phenomena. Perception occurs in cells, and the relationship between the static, genetic, and generative levels may explain some aspects of embryogenesis that are comprehensible neither through a strictly reductionist nor a whole-body approach to biological explanation. Multicellular bodies and ecosystems are not differentiated from one another according to radically different types of organization but by the extent of integration in their organization.³ Humans are both submerged within an embedded contextuality that they affect and which affects them *and* emerge from the embeddedness of others (their intra-organic companions) whose phenomenal worlds humans affect through living. In any case, the degree of integration is very consequential for the type of learning and co-emergence that can occur.

Evolutionary generativity

Husserl points out that the emergence of a new species, such as a wolf, creates new “teleological circumstances” that become normal and stable (Steinbock 2003, p. 294). New species have novel behavior brought forth by the relational milieu that the species emerged in, but in turn, enable certain types of interactions. Just as the specification of an embryonic liver cell, instigated through relationship, contributes to further intercellular dynamics, the evolution of a species is also in a co-emerging dynamic with multiple species regulating one another. In both cases, the style of the interactions is contingent upon the perceptual possibilities of the various beings disclosing one another in each other’s milieus.

However, there are novel problems that emerge in evolutionary generativity. Consider the green katydid. We start by examining the shape and texture of the insect’s body. It is green and smooth and has a partitioning pattern on its wings and body that immediately recalls the veins of a leaf. And yet, unlike the cell within the embryo or even the plant foraging for phosphorous, these characteristics do not appear as expressive of the katydid’s direct interactions in its milieu. The traits seems fixed, not physiognomic, and as something handed to the insect. The individual katydid did not develop greenness or pseudo-venation to deal with a concrete lived situation, so the traits seems to transcend the katydid’s milieu–aptitude structuralization. Merleau-Ponty and Uexküll both called such phenomena “magical,” by which they did not mean anything supernatural. They refer to the feat where things fit together in a way that does not arise through dynamic co-emergence. The green insect is magical because it emerged into the world organized in such a way that it would easily find camouflage in a certain habitat. By observing the katydid, intercorporeal

³ There are also intermediates between humans and the ecosystem in terms of organizational tightness, such as plants, quorum-sensing bacteria, and slime molds.

entwining becomes clearer. Its color and texture do not broadcast its milieu; rather, these formal features reveal the milieus of others. We encounter, in particular, information about the visual field of certain birds, insects, and amphibians. In so doing, the katydid indirectly makes known its species concern for evading death.

The possibility of mimicry, markings, camouflage, displays, and rituals, as “innate” biologically evolved characteristics, points to a mutual “contamination” (Merleau-Ponty and Séglaard 2003, p. 186) of two different subjectivities’ milieus. The phenomenal world of one species or organism can imprint formal possibilities onto another, directing the future range of interactions possible for an organism before it has even begun interacting in the world. Because one organism’s appearance is based on the sensory capacities of another, ultimately “what exists are not separated animals, but an interanimality” (p. 189), and so the outer body, as Portmann noted, appears as a “work of art,” in contrast to the inner body, which appears like a “machine” (p. 187). The outer form, suffused with meaning for those around it, is a “semantic ensemble” (p. 187), and insofar as meaning emerges in this virtual world of form, there is already the kernel of symbolic development.⁴ Merleau-Ponty refers to “innate symbols” (p. 195), such as the crest of the cock (p. 187). These organs of display are “semantic organs” that “act through the meaning that they acquire during milieu-specific interpretations” (Kleisner 2008, p. 207). Merleau-Ponty and Séglaard (1995, p. 244) writes that “*le corps est tout entier manière d’exprimer*,” but an important detail is miscommunicated in Vallier’s English translation. It is not that the body is entirely “a manner of expression” (2003, p. 187, *emphasis added*), rather the body is entirely *manner* of expression. It is not an object but a mode, it is not a noun but a grammatical relation.

The symbolic bodies’ features provoke meanings dependent on and, in turn, maintaining relationships. In so doing, they bring forth virtual norms. That the form bodies take are negotiated by those who make meaning from them points to the intersubjective constitution of normativity. While the geohistorical scale is vast, the evolutionary development of morphology has all the characteristics of a generative activity: the experience of the individual in its milieu is constituted by, but in turn reconstitutes, a virtual dimension of norms that has been instituted through the development of intersubjective activity. While the norm seems innate from the perspective of the individual, it is subject to development and remains normative through the continued interactions that depend on it. Through a history of interactions, life brings the world of form into deeper and richer ontological significance. Through the generativity of biological evolution, the transcendentalist’s world of surfaces and nature’s incessant dynamics are not merely interwoven but unitary. Phenomenology, the description of phenomenal experience as it appears, finds itself in contact with the being it sought to bracket out in static analysis.

⁴ When describing Logos (“in the sense of language”), Merleau-Ponty (2003, p. 212) explains that “there is a Logos of the natural esthetic world, on which the Logos of language relies.” Meaning is established in the bodies of interacting living things long before life has found a new way to develop meaning in the diacritics of human symbol systems, and all the essential structures of the former normativity remain in the latter.

Generative phenomenology and the human experience

I have suggested that all living beings have milieus that are invariably actualized through the intersections with others offered by phenomenal intercorporeality. Although preliminary, I have tried to show this generativity in ecological, embryological, and evolutionary development. The science of life benefits from a generative orientation because form, in each case, is explained by inter-organismic structures of signification. However, conducting generative analyses on biological systems has another important implication for humans. By simultaneously acknowledging the milieu-constituting nature of all life and the indeterminate protocultural nature of such constitution, humans are solicited to consider other organisms as beings not merely effected, but *affected* by our manner of interaction with them. In other words, conducting generative analyses on other organisms has a generative effect on human phenomenality, by vastly extending the range of organisms considered relevant in contributing to cultural and historical development. Intersubjectivity, culture, and historicity are not insulated human experiences, but the very processes and products shaping ecologies on all levels. The unfolding milieus of other organisms are now seen as interbleeding with our own: diverse species are not isolated from one another and we fashion cultural and historical trajectories through our interactions.

As beings not merely capable of having phenomenality, but of *conducting* phenomenology, we bring aspects of the constitutive structure of the biosphere into consciousness. Doing so sets us into new relations with respect to the biological world. Although “phenomenological reflection is abnormal in relation to [the natural attitude], ... it institutes a new normality and a new teleology that brings it to expression in creative ways” (Steinbock 2003, p. 295). This means that the phenomenologist “must take a position with respect to the way sense is constituted ... she must be engaged in how sense should, ought to or must take shape” because the constitution of sense “concerns the future orientation of sense, which is to say, the *generation of new historical meaning structures*” (Steinbock 1995, pp. 189–190, 196; quoted in Smyth 2007, p. 199, emphasis in original). The movement back to static and genetic engagement has an ethical weight that comes with knowing that, although the structure of experience funnels particular trajectories for milieu constitution, experience is also changeable *because* it has been constituted culturally and historically. Thus, static phenomenology, prior to being revisited after a generative turn, is not simply suffused with a potentially misleading transcendental idealism, as critics of (early) Husserl noted. Knowledge gained through static analyses deceptively assumes ethical neutrality. In this sense, static phenomenological reduction follows the amorality of other types of reduction. Biological reduction, for example, in describing living beings as the product of genetic codes, disregards the biological meaning inherent in formal relations between organisms. But it is on this formal—albeit virtual—level that everything except physicochemistry occurs!

One possible invitation is to reconceive Husserl’s notion of “homeworld” (*Heimwelt*). To move beyond the spatiotemporal world of the concrete ego into the geohistorical world through which phenomenal experience is made sense, Husserl describes two concepts that exist through intersubjectivity and intergenerationality: homeworld and alienworld (*Fremdwelt*). Our homeworld is the world that is constituted normatively around patterns optimized by those around us. “Home companions” co-

constitute our “home,” and by extension, that which is not our home. “Members of an alienworld are liminally co-constitutors of [the] homeworld” (Steinbock 2003, p. 298) too—by the boundary that they enforce from the outside. Husserl notes that animals can be home companions, and we can further develop a description of the extent of the nonhuman presence in the constitution of the phenomenal experience of home. Throughout most of history and throughout most of the Earth even today, plants and animals that co-inhabit bioregions with humans have been considered members of the human home to the extent that humans depend on them, interact with them, are familiar with their seasonal cycles, movements and styles, growing habits, and environmental preferences. Living in rural Southeast Asia, I have noticed that the same word, *baan*, means both home and village in Lao and Thai languages. A *baan* is the focal orienting concept in rural life, and it includes not only houses, but farm animals, cropland, community forests, and local water supplies. Meanwhile, modern, city-dwelling humans learn what their home companions are through technology-mediated generativity. Television sets and other forms of media render photogenic fauna members of an emerging global home, while the “alien” is pushed outside of the earth’s atmosphere. In both cases, human milieus are enriched through the presence of other species. As Steinbock (2003, p. 312) notes, “an eagle, through its extraordinary sight, a dog through its ability to smell, ... teach us something of ‘our’ world that we never knew before.” However, even shared perceptions teaches us something. That we can identify katydid camouflage reveals that the esthetic world is more than anthropomorphic and that appearance as we see it is substantiated in other species’ experiences. The phenomenal is validated and the transcendentalist solipsism punctured by both the katydid and its foes, such as the antwrens and mantids.

As indicated, our milieus now include the fact that we are implicated in the realization of the milieus of other species directly and indirectly through our activities. Conservation biology has yet to deeply consider initiatives from such a phenomenological perspective, but some ecophilosophers, such as Jim Cheney and Anthony Weston (1999), speak of the importance of an “environmental etiquette” that is respectful and open to the possibility of a lived dimension in interspecies encounters and thereby *becomes* sensitive to the dynamics of intersubjectivity. Insofar as generative phenomenology “is concerned ... with identifying *essential*, *a priori* structures that bear on the *re-constitution* of homeworlds and alienworlds over the generations” (Steinbock 2003, p. 298, emphasis in original), phenomenology must pay attention not merely to language, as this is limited to certain aspects of human generativity only, but also to the gestural, pheromonal, paralinguistic, and other ways that the varied members of our home interact and communicate.

Acknowledgments Thank you to Evan Thompson, Eric Bredo, and two anonymous reviewers for the thoughtful comments on an earlier draft of this article.

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