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Aesthetics of Language Evolution

Original Study

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Could a theory of aesthetic sense-making help move domain-general theories of evolution beyond mere *Darwinian assumptions*? To show how this could work, I apply C. S. Peirce's approach to analogy as active-inference and his triadic theory of evolution to an original language development case study involving novel paradigm formation over a six-week period by a child aged 1;07–1;09 in the domain of free play focused on a set of blocks. In referring to the blocks, the child produces creative lexical blends involving abstractions drawn from shape, colour, and food-based iconicities. In the process, evidence for three interacting (irreducible but interdependent) modes of language evolution emerge that are arguably domain-general: analogy, automation, and diagrammatization (previously defined in Pelkey 2013, 2015, 2019). The bridging connections in question require a process-oriented semiotic perspective grounded in the experiential, or tonal, relations of iconicity. The argument helps clarify the aesthetic nature of analogy by highlighting distinctions between analogic agency, automated processing, and diagrammatic process in ways that are germane for evolutionary theory in general, to better clarify the relationship between aesthetics as semiotic fitting (Kull 2022) and diagrammatization as semiotic evolution.

Dedicated to the Seahorse, my beloved daughter (pseudonym Lisa), who inspired this article and so much else.

1. INTRODUCTION: BIOSEMIOTIC AESTHETICS AND ANALOGIC SENSEMAKING IN EVOLUTION

Speaking of language change as "evolution" has come to seem like a metaphorical mapping grounded in general biology. This is remarkable since the original discoverers of evolution were not biologists (or naturalists) researching comparative relationships between species; they were, rather, linguists (or philologists) researching comparative relationships between languages (Greenberg 1957, McMahon 1994, Alter 1999, Wyhe 2005, Atkinson, Gray 2005, Pelkey 2015, Pelkey & Augustyn 2023). In other words, history demonstrates that the original pattern worked the other way around: evolutionary theory was borrowed into biology from linguistics. Even so, mainstream approaches to identifying a domain-general theory of evolution – a unified approach encompassing language and culture as much as biology and genetics – continues to find little more than broad-brush thematic connections between the two domains, grounded primarily, if not exclusively, in biology-based analogies (see e.g., Ritt 2004, Du Crest et al. 2023, List 2023; see also Pelkey 2015, Pleyer & Hartmann 2024, 41–46 for

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further critical reviews). In this paper, I suggest that such approaches and conclusions tell us more about the cultural and philosophical presuppositions of those who promulgate them than they do about basic categories and processes in question. Key among these assumptions is that the starting point of such a project should be Darwinian. Du Crest et al. (2023) make this connection transparent, identifying domain-general evolution with "generalized Darwinism".

As a result, evolutionary linguists tend to search for mechanized selection- and competition-driven dynamics in language change or processes of conventionalization and entrenchment, to the neglect of other dynamics (see e.g. Croft 2000, Ritt 2004, Schmid 2020). But since many aspects of Darwinian evolutionary theory have no clear corollary in language evolution, and vice-versa, List does well to note that "many scholars still emphasize the peculiarity of language evolution in comparison with biological evolution, and some scholars even find it misleading to discuss language change as an evolutionary phenomenon at all" (List 2023, 104). Others might counter that linguistics can tell us just as much about a domain-general theory of evolution as biology can, but for an approach to be truly domain-general, it would ideally be grounded in a field-unifying theory – one that goes beyond both and is beholden to neither. The outline of such an approach has been available since the late 1890s through the work of Charles S. Peirce.

In this paper, I draw attention to a domain-general alternative to (neo-)Darwinian evolutionary theory based primarily on Peirce's semiotic theory of evolution (2010[1890–1892]), which incorporates Darwinian considerations without defaulting to them. I also suggest upgrades for Peirce's ideas by drawing on important developments from more recent semiotic approaches to both language evolution and biological evolution that show how an aesthetic, agentive approach that is analogically oriented (instead of being mechanistically determined) can provide explanatory leverage in both domains. I do this with reference to an empirical case study drawn from research in a child language acquisition context, following a mandate first asserted by Andersen (1978). The approach that emerges can be characterized as a re-orientation to future causation and the fitness of evolutionary potential. But instead of assuming fitness is primarily concerned with mechanistic replication, immediate survival, or conquering prowess, I follow Hoffmeyer (2008) and Kull (2022) to emphasize goodness of fit as a feeling-based pattern-solving activity. In short, the approach orients to analogy over mechanism, promoting play and improvisation over competition and domination (see also Hustak & Meyers 2012).

This is made possible by unifying reflections on linguistic diagrammatization (Shapiro 1985, 1991, 2002; Pelkey 2013, 2015) and biosemiotic aesthetics (Hoffmeyer 1997, 2008; Kull 2022, 2023). In the sections that follow, I overview each of these three strands, starting with Kull's biosemiotic aesthetics, followed by a discussion of its relationships with future causation and diagrammatization in Section 3. Diagrammatization involves speakers in pattern-finding activities that make better sense of part-whole relationships between language and sense and Biosemiotic fitting involves organisms in the same activities focused on species-environment relationships of part-whole fitting. The parallels are clarified with reference to purpose-driven action and its habit-breaking, habit-taking future-orientation. I then situate these themes in Peirce's domain-general theory of evolution before turning to a micro-scale example of language change from a language acquisition context to illustrate in Section 4. I then offer further discussion on multi-scalar and domain-general evolution in Section 5 before concluding the paper with a summary of insights, implications, and future directions.

2. BIOSEMIOTIC AESTHETICS AS AN ALTERNATIVE TO DARWINIAN EVOLUTION

Kull's proposal for a biosemiotic aesthetics is premised on organisms and populations as agents working to enhance compatibilities and resolve incompatibilities between themselves and their environments – or more specifically, between themselves both internally and intraspecifically, and with their environments both interspecifically and ecologically. Kull (2022) argues that in addition to habit-taking, three elements or dynamics are crucial for semiosis in any living system: choice, fitting, and beauty.

Without choice, there would be no degree of agentiveness or freedom and therefore no way to introduce habit-taking into a living system. Instead, there would only be meaningless repetition and automation. Without dynamics of fitting or fittedness, habits that form could never be modified; but meaningful habits must be open for modification drawn from memory-based expectations of what will be compatible or incompatible, fitting or unfitting, in interactions with conspecifics and/or the broader environment. As for the third dynamic, Kull argues that beauty corresponds with whatever is most fitting or most compatible in relation to everything else.

This understanding of beauty must not be confused with anthropocentric conceptions or anthropomorphic associations (e.g., with visual perception and sexual attraction). Instead, Kull's account cuts against the grain of Darwinian theory. In Darwinian accounts of aesthetics, perceptions of beauty or fitness are merely epiphenomena of sexual selection. This stands in stark contrast to Kull's biosemiotic aesthetics where beauty plays a functional, meaning-oriented role. The drive for beauty in an organism or population is a drive for "omnirelational semiotic fitting", according to Kull, who also clarifies that the quality of beauty in this sense is "more in process than in form, or rather in morphogenesis" (2022, 13). As a result, what is most beautiful about a given living system may very well correspond with what is most hidden from view – especially from an uninitiated human perspective.

Kull's biosemiotic aesthetics is promising from several perspectives. I note three here before proceeding. The first is a profoundly important aspect of aesthetics

that is implicit in Kull's account but ultimately undeveloped: i.e., aesthetics as lived, experiential feeling – ranging from sensation and sensory perception to kinesthesia, proprioception, affect, emotion, and other qualitative subjective states (see Johnson 2007 for an overview). To take habits according to their goodness of fit relative to other patterns and habits is to make feeling-based judgments. However simple or complex these judgments may be relative to the organism or population in question, they are grounded in tonal iconicity: the subjective, felt quality of all iconic relations (Peirce: c.1903, CP 2.243–2.246; 1906, CP 4.537n3; Smith 1972; Champagne 2018; Pelkey 2022).

Another important feature of Kull's biosemiotic aesthetics is its promise for extension to other domains beyond biology proper, including language and culture (Pelkey 2015; Pelkey, Augustyn 2022) and for unifying general semiotics (Bennett 2022, Lacková 2022, 2023). Closely related to this is a third promising feature of Kull's biosemiotic aesthetics that sets it up for further integration with domain-general theories of evolution: i.e., its compatibility with future-oriented modes of causation, also known as teleology or final causation and their relationship with diagrammatization. I turn to a discussion of these themes in the next section.

3. FROM FINAL CAUSATION TO DIAGRAMMATIZATION

A distinct mode of causation oriented toward the future has long been recognized (and problematized) in the Western tradition, at least since Aristotle, largely falling out of favour in theory building over the past two hundred years due to infelicitous associations between teleology and theology. But teleology need not be esoteric or spiritualized any more than memory and memory-based anticipation, both of which are arguably present in all living systems – however vivid or vague, conscious or unconscious. Possible future events are relevant (or meaningful) only in relation to the past, just as the future itself is virtual and potential instead of factual or actual. As such, future-oriented causation can be understood as a kind of virtual influence of the anticipated future on the present in relation to patterns of memory inherited from the past. When mundane chance fluctuations, outside influences, or extraordinary catastrophes are encountered, a living system (organism or population) must adjust by reworking relationships between the inherited past and the virtual future. This upgraded and clarified account of Aristotelian final causation is developed carefully, and in much more detail, in the work of John Deely (2001, 2008, 2009), developing ideas from John Poinsot to Charles S. Peirce. See Pelkey (2013, 2015) and Lacková (2018) for linguistic applications and Švorcová et al. (2023) and Corning et al. (2023) for implicitly congruent biological applications.

On Peirce's account (2010[1890–1892]; 1902), final causation contrasts most clearly with chance variation (*tychasm*) on one hand and efficient causation (*anancasm*) on the other, although the three are clearly complementary and intertwining, with final causation bringing both modes together toward ongoing development or growth (*agapasm*). Both chance variation and efficient causation are already at home in Darwinian and neo-Darwinian accounts of evolution. What is missing is any account of process itself (Deacon 2012, Pelkey 2015). While chance variation corresponds with genetic fluctuations or environmental stressors, efficient causation corresponds with mechanical necessity, the automated replication of replicators.

Applied to biological evolution, as Švorcová et al. (2023) argue, "the concept of teleology is thus a combination of chance, necessity, habit, and spontaneity (i.e. all three types of Peircean evolution)", associated with agentivity (see also Sharov, Tønnessen 2021). The future-oriented dimension of evolution integrates past and future relations "based on interaction with the environment, repetition, and internalisation of experiences, which allows for the following of goals without conscious mind" (Švorcová et al. 2023, 420). These dynamics are not only compatible with Kull's biosemiotic aesthetics, but they also seem to be general descriptions of the same dynamics. To better understand how this is so, it is helpful to turn to the development of the theory of final causation in language evolution for more perspective.

Applied to linguistic evolution, Lacková (2018) notes Roman Jakobson's key divergence from the theoretical status quo in anticipating the development of these themes by emphasizing "the creative and active role of speakers, which is incompatible with teleology in a strict sense: teleology as reaching a 'telos' leaves no space for active participation, but only for a blind execution of what has been predetermined/preselected" (Lacková 2018, 118). This account reorients to the telos or purpose of a given language as a socially-oriented complex system such that "linguistic changes […] have the intention to exert an action on the system" as a whole (Jakobson 1962, 5–6; Lacková 2018, 110). These insights from Jakobson went on to be developed by linguists such as Anttila (1989) and Shapiro (1985) through the lens of Peircean diagrammatization: i.e., "the influence of a pattern" (Shapiro 1985, 18) or the dynamic, unending process of sense-making through which an organism/speaker or population/speech community works to find better fit between part-whole relationships over time (see also Shapiro 1985, 1991, 2002, 2023; Pelkey 2013, 2015, 2019).

To appreciate this shift, and its implications, it is helpful to turn to the mereological building blocks of diagrams: i.e., part-whole relations. Peirce notes a complementary relationship between efficient and final causation in the evolution of part-whole relationships. Whereas in efficient, mechanical causation: "the parts compose the whole" as pre-given automated relationships, in final, future-oriented causation, "the whole calls out its parts" (Peirce 1998[1902]). Chance variation and spontaneous play serve to reorganize part-whole relations, requiring new orientations to virtual futures in which ill-matched elements find better fit with the whole, requiring a "habit

of taking and laying aside habits" (Peirce 1901, CP 6.101). Since this description could apply equally well as a paraphrase of Kull's biosemiotic aesthetics introduced above, it is worth considering the possibility that a general theory of evolution might also be a semiotic/aesthetic theory of evolution.

Peirce's semiotic theory of evolution identifies three main modalities or causal forces working interdependently, as introduced above: (1) Chance or *Tychasm*, (2) Law or *Anancasm*, and (3) Habit-Taking or Agapasm, in which the third brings together the first and second working toward growth-oriented ends, intent on finding better fit between parts and wholes, organisms and environments (Peirce 2010 1890–1892]). If these dynamics are general, we should expect them to be present not only across domains (biological, cultural, linguistic, etc.) but also at every scale within a given domain. To illustrate this point, and to provide a clearer case-study for comparative discussion, I turn now to a micro-scalar example drawn from linguistic evolution at the level of first-language acquisition.

4. MICRO-SCALAR TRIADIC EVOLUTION: A LANGUAGE ACQUISITION CASE STUDY

This case study is based on diachronic observation of a child aged 1;07–1;09 (19–21 months old) engaged in free play focused on the domain of wooden blocks in four colours (green, blue, red, and yellow) and two shapes (basic cubes and rectangular cuboids), as illustrated in Figure 1. The study is drawn from firsthand fieldwork in my own home, working as both a father and a language acquisition researcher in 2009. During this time, I was living in Fort Langley, British Columbia, Canada, leading a course on language acquisition at the University of the Fraser Valley (Abbotsford, BC) and keeping linguistic fieldnotes to document my daughter's own first language acquisition. The selected study here is represented with her full knowledge and informed consent under conditions of anonymity. For this reason, I adopt her pseudonym of choice: "Lisa".

Notably, and predictably at first, Lisa was content to refer to all eight types of material using the adult category 'block', mapped onto her own phonological variation on the lexeme: /bwɑk/. This isomorphic lexical mapping could have continued unchanged, in which case the observation would merely be a study of linguistic *anancasm* at work: the automated maintenance of efficient causation, replicating the relations of the past. In that case, there would be no case study at all, naturally. But one day something unusual happened: a sign of things to come, a harbinger of discontent with the inherited symbolic association.

One day I overheard Lisa refer to one of the blocks as /kini/. My ears perked up. "Where is the kini?" I asked, not quite understanding. Lisa held up a long, green block. Curious, but careful not to correct or evaluate, I asked about the other seven shapes and colors one-by-one. They were all still merely /bwɑk/, with one exception: the cube-shaped red block, which was now /ɑpu/. This I recognized immediately as her version of 'apple'; and that is when it dawned on me. The term /kini/ was her own phonological clipping of 'zucchini' (also known as 'courgette' in much of the French and English-speaking world): a long, green summer squash. And so appeared the first analogic shift in an erstwhile stable category: a playful intervention based on abductive experimentation or *tychasm* with a category or domain that was apparently far too underspecified. After all, with so much patent variation in form and color, why was there no matching variation in the lexical domain?

This was also the first step in diagrammatization or semiotic fitting, a future-oriented, aesthetic sense-making activity geared toward finding better fit between parts and wholes. This mode of evolution corresponds with Peircean *agapasm*, or evolution by creative love, which "finding a germ of loveliness in the hateful, gradually warms it to life and makes it lovely" (2010[1890–1892], 186). The work was both playful and serious. As indicated in Figure 2, sometimes during this period Lisa used /kini/ to refer to blocks of all shapes and sizes,

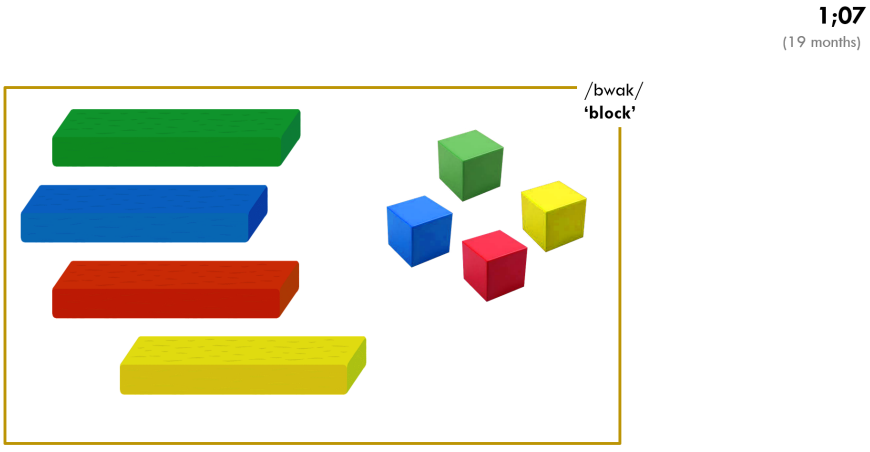

Figure 1. Phase A: Basic adoption of adult category

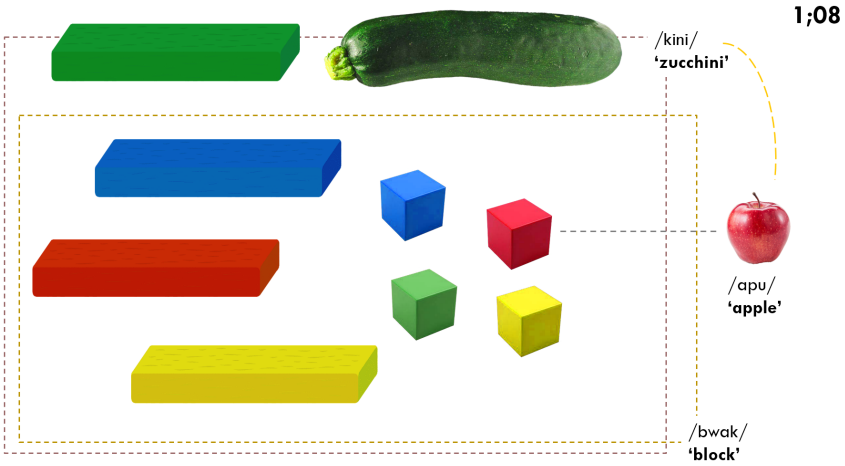

Figure 2. Phase B: First analogic shift. Markedness ensues.

not only the namesake long green block. In other words, the new category was decisive but unstable and in flux. I was fascinated but took care not to intervene beyond calm curiosity. Already, though, a future-oriented proto-paradigm or potential paradigm was emerging: the possibility that food-based analogies might apply to all blocks.

In keeping with semiotic final causation, the outcome was anything but predictable, and only in retrospect did I realize that markedness was already in play: first at the level of lexicalization, by Lisa's differentiation or specification of two members belonging to a generic class based on their respective shape and colour, and second by extension of what was now the most prototypical block to potentially encompass all members of the category, while continuing in free-variation with the inherited (adult) lexical category.

A few weeks later, in the middle of a free play session, I asked again casually about the status of the 'blocks'. The same pattern held, with one exception: the oblong red block was now /rwet kini/, or 'red zucchini'. I did my best not to react, but this surprised and delighted me. Hence, the emergence of the first embedded paradigm. The oblong red block was now doubly marked, and the oblong green block was even more prototypical, except when the other blocks were referred to in free variation with the inherited adult term. This transitional phase is illustrated in Figure 3.

A few days later, back at play with the kini blocks, I asked again off-hand about each of the eight types and found that the paradigm had tripled in terms of meaningful paradigmaticity, with a major category revision in the process. As illustrated in Figure 4, the red cube block was no longer an 'apple' but a 'strawberry', or /stabej/ in Lisa's 1;09 parlance. This shift was creative, but it was not random, as I discovered when asking about the blue cube block, which was now identified as a /glubej/ or 'blueberry', making better sense of part-whole relationships based on polysemiotic criteria of relative shape and colour. Elsewhere, the long blue

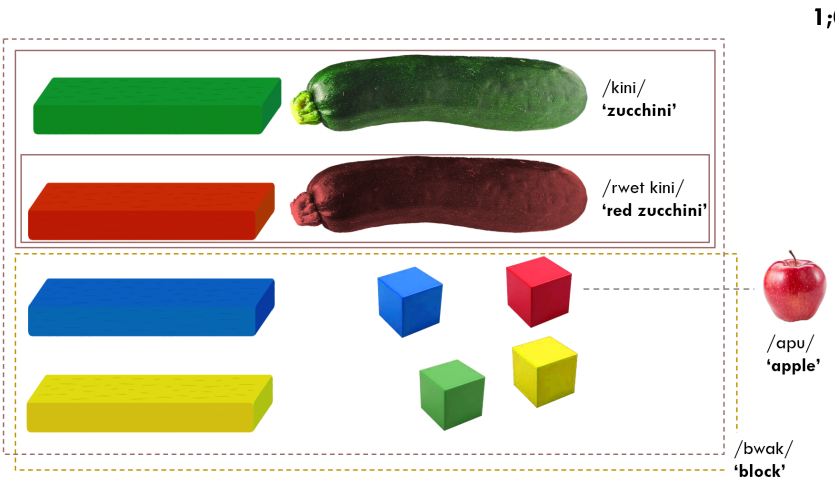

Figure 3. Phase C: Second analogic shift with markedness reversal and simple paradigmaticity.

block was now identified as /bu kini/ 'blue zucchini'; but to my surprise the long yellow block was not a 'yellow zucchini'; instead, as Lisa informed me, it was a /nænə/ or 'banana'. As for the yellow and green cube-shaped blocks, they were still merely /bwɑk/, though the yellow cube would also sometimes be referred to as a /nænə/.

In short, during this two-month window of free play and sense-making through language, Lisa leveraged creative analogies (or complex conceptual blends) between shape, colour and food to find better fit between part-whole relationships in an inherited category that she found to be underspecified, or far too vague, relative to its iconic potential. Although the process was clearly future-oriented and the outcome was much more paradigmatic and meaningful in the end, the specific outcome was anything but predictable or deterministic from the beginning; and sub-categories were in a constant state of flux throughout, with the exception of /kini/, the originating analogy.

Three key points are in order here related to diagrammatic iconicity and to analogic pattern-solving activities oriented to diagrammatic icons. First, it is important to note that the analogies involved in this spontaneous renovation of a lexical field were always active or in process as a kind of open inquiry: not static formalisms but agent-driven comparative relations between diagrams or iconic sign patterns undertaken through three basic modes of inference: guessing (abduction), concluding (deduction), and testing (induction), as described by Peirce (1902, CP 2.787, 1903, CP 2.77, 4.33; see also Misiewicz 2020; Stjernfelt 2022). Second, it is important to note that diagrammatic iconicity is always sensuous, or aesthetic, always referring to qualia or qualisigns in the representamen (Peirce: c.1903, CP 2.243–2.246; 1906, CP 4.537n3; Smith 1972; Champagne 2018; Pelkey 2022). Third, it is important to acknowledge that prominent role that playfulness and delight played in this process (vs. dull problem-solving or Stoic adherence to duty or ideal). This point too may apply more broadly than typically considered in the evolution (and co-evolution) of species, as noted for example by Hustak and Meyers (2012).

Returning to Lisa's lexical revolution with these points in mind, we may note that the /kini/ analogy was the first to automate, and it quickly shifted from the most marked member, by differentiation, to the most prototypical member, by extension or generalization. The ensuing productive lexicalization template of [color]+/kini/ had limited scope, however, applying only to those items that had no immediately apparent corresponding food category. This provides further evidence of the priority of experiential sense-making over analytic systematization. The openness or fallibility of the process is also apparent in Lisa's experimentation with 'apple', which was discarded in favour of a more elegant fit with berries since it could incorporate more members. In the end only the green and yellow cube-shaped blocks retained their original vagueness.

Soon after this, Lisa abandoned her aesthetic lexical revolution in this domain for other pursuits. In the process, she capitulated to the adult shorthand 'block', which also slowly came to match the adult pattern of speech phonologically: /bwɑk/ > /blɑk/. Naturally, the reasons why her more sensible paradigmatization did not 'stick' are due to the lack of uptake by a broader community, the broader need for communicative efficiency, and the limitations or constraints of time and attention, among other constraints (a la Deacon 2003). None of these constraints inhibited Lisa's experimentation in the moment, though, providing us with a helpful reminder that language evolution, like all other modes of evolution is active wherever agents are looking to make better sense of things, seeking for better aesthetic fit between parts and wholes, organism and niche, population and environment, regardless of scale, domain or timeframe. Such is the process of diagrammatization or semiotic fitting.

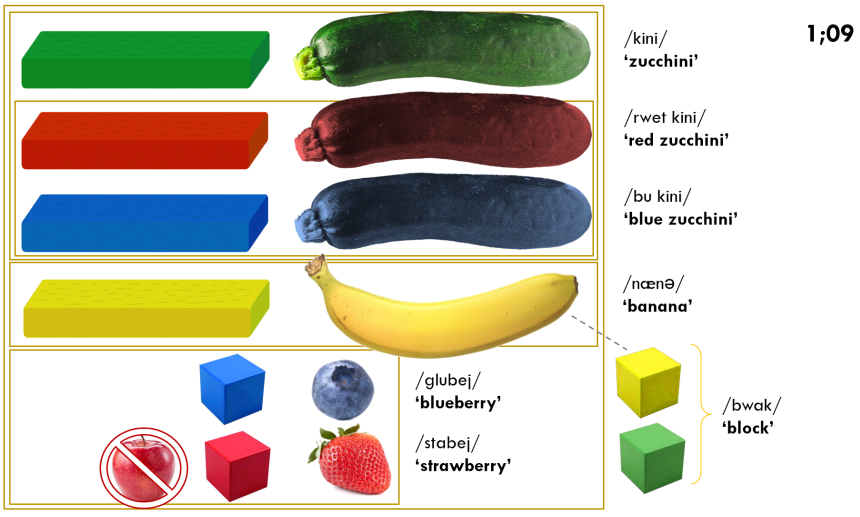

Figure 4. Phase D: Multi-paradigmaticity with old domain revision and new domain creation.

5. DOMAIN-GENERAL EVOLUTION AS TRIADIC AND MULTI-SCALAR

Semiotic fitting, or diagrammatization, is usually approached as something far subtler, more unwitting, and distributed across populations and generations; but the same clear dynamics are present at both micro- and macro-levels of language evolution. This includes traces of chance variation, automated replication, and future-oriented pattern solving, in addition to the finer details of internal paradigmatization, the chance emergence of partial paradigms, the free-variation between alternative possibilities, the purposeful growth of the system, and the unpredictability of outcomes, all of which can also be identified even in the most stable domains cross-linguistically, such as closed-class morphological paradigms. While variation and pattern solving might be expected in open class patterns such as noun classes, closed-class paradigms are more resistant to change. To focus on one such stable domain, consider the development of base-ten numeral systems for example. While it is possible to reconstruct a tidy base-ten counting system in Indo-European, just as in Old Chinese, variant patterns across Indo-European languages suggest the presence of proto-variation in this domain among dialects of Indo-European as they diverged across the globe.

As Table 1 illustrates, although both Farsi and English speakers have eventually inherited a base-ten system, traces of an earlier (Germanic) base-twelve system are still apparent in the English numerals 'eleven' and 'twelve' (instead of **oneteen* and **twoteen*). Martinez (1999) finds evidence for base-8 and base-12 in addition to base-10 counting systems at the Indo-European proto-stage. Accordingly, Calude and Verkerk (2016) find that Indo-European languages show the greatest variability between 11-19. Many non-IE languages such as Mandarin, by contrast, reflect the preservation of a base-ten system that was already stable at the proto-stage.

Morphophonemic processes of lexicalization in numerals 'eleven' through 'nineteen' disrupt the transparency of the paradigm in Farsi with the exception of *chahārdah* 'fourteen'. Even so, embedded micro-paradigms emerge to provide better aesthetic fitting between parts and whole, as can be noted in the pair *pānzdah–shānzdah* 'fifteen-sixteen', which shows evidence of a phonological shift based on vowel harmony to complement the next harmonizing pair, *hefdah–hejdah* 'seventeen-eighteen'.

The interaction of chance (tycasm), law (anancasm), and habit-taking (agapasm) in linguistic evolution has clear parallels in biological evolution (Pelkey 2015; Švorcová et al. 2023). Studies that range beyond genetic evolution to pay attention to symbiotic, epigenetic, and ontogenetic development often notice the same kinds of dynamics at work without registering the presence of a field-unifying theory of evolution (see, e.g., Margulis & Fester 1991, Jablonka & Lamb 2014). Studies of semiotic fitting (Hoffmeyer 1997; 2008; Kull 2022) and agency-driven evolution (Sharov & Kull 2023, Sharov & Tønnessen 2021) in biosemiotics come even closer to outright acknowledgement of these relationships, although the biological/natural vs. linguistic/cultural divide still seems too wide to bridge for such studies.

Panning out to the level of aesthetic fitting and semiotic (final) causation, the emerging parallels are too promising to pass over lightly. Theorists of art such as Wolterstorff (1980, 96–121) have long noted "fittingness" to be an aesthetic principle that bridges the fine arts and mundane existence. Linguists such as Shapiro have long defined diagrammatization as "a process by which unconformities in languages are reduced or eliminated over time" through community-driven processes of finding "a kind of goodness (of fit)" (Shapiro 2002,

		Farsi	English	Proto-IE		Mandarin
1	یک	yek	One	oinos	一	yī
2	دو	do	Two	dwōu	二	èr
3	سه	se	Three	trejes	三	sān
4	چهار	chahār	Four	qétwores	四	sì
5	پنج	panj	Five	penqe	五	wǔ
6	شش	shesh	Six	seks	六	liù
7	هفت	haft	Seven	septḿ	七	qī
8	هشت	hasht	Eight	oktṓu	八	bā
9	نه	noh	Nine	newn̥	九	jiǔ
10	ده	dah	Ten	dekm̥	十	shí
11	یازده	yāzdah	Eleven	sémdekm̥	十一	shí yī
12	دوازده	davāzdah	Twelve	dwōu dekm̥	十二	shí èr
13	سیزده	sizdah	Thirteen	trejes dekm̥	十三	shí sān
14	چهارده	chahārdah	Fourteen	qétwores dekm̥	十四	shí sì
15	پانزده	pānzdah	Fifteen	penqe dekm̥	十五	shí wǔ
16	شانزده	shānzdah	Sixteen	sweks dekm̥	十六	shí liù
17	هفده	hefdah	Seventeen	septḿ dekm̥	十七	shí qī
18	هجده	hejdah	Eighteen	oktṓ dekm̥	十八	shí bā
19	نوزده	nūzdah	Nineteen	newn̥ dekm̥	十九	shí jiǔ

Table 1. Diagrammatization in variant base-ten counting systems

178) without considering congruencies with biological evolution. Hoffmeyer (2008) and Kull (2020, 2022) make virtually the same claims for semiotic fitting in biological evolution without registering the parallels in the other direction. Consider Kull's observation, for example, that "as a result of semiotic fitting which resolves incompatibilities and tends to find the compatible, there exists a tendency in living nature to become beautiful. The nature of this quality identified as beautiful is *more in process than in form*, or rather in morphogenesis" (Kull 2022, 13). As I have shown above, all such parallels are compatible (and further illuminated by) Peirce's triadic, evolutionary account.

6. CONCLUSION: SEMIOTIC CAUSATION AND EVOLUTIONARY AESTHETICS

Imagine the revolutionary potential of having a shared, theory-unifying basis for approaching evolution as an aesthetic, agentive activity of meaningful, future-oriented pattern solving from the individual to the population level, at both micro- and macro-scales, across natural, cultural, and linguistic domains. Widespread admission of these general relationships or parallels may still be far in the distant future; and even this would only be a starting point. The nature, degrees, and roles of agency, analogy, play, feeling, and topology, would be open to further testing and clarification, along with many other related questions, to say nothing of the need for integration of findings previously described under alternative paradigms.

Important domain-specific distinctions would still be needed as well, since the kind of diagrammatization involved in language evolution necessarily involves different degrees of self-controlled agency in the adjustment of patterns between symbolic relations, involving cognitive processes that Peirce refers to as prescission and hypostatic abstraction (Peirce c.1880: CP 1.353; 1893, CP 2.428; c.1902, CP 4.235; c.1905, CP 5.534; Stjernfelt 2007, 241–55; 2014, 162–77; Champagne 2018). Others have characterized similar distinctions between simplex blending vs. complex blending (Fauconnier and Turner 2002, Turner 2014, Turner et al. 2021) or general analogy vs. creative analogy (Pelkey 2016, 2017). Whatever the case, as Hoffmeyer suggests, language is simply "a special case of a more general biosemiosis" (2008, 299); and we now have grounds for understanding Hoffmeyer's point in relation to language evolution.

In spite of its challenges, the overarching, basic point that should be considered here is that even an oblique reorientation to the general relationships identified above can yield immediate insight into both biological/natural and linguistic/cultural domains of evolution and their congruence. And the implications are non-trivial. Opening up to the domain-general dynamics of "multirelational fittedness" (Kull 2022, 17) entails a reorientation to life and language in which the growth of aesthetic meaning becomes central and pervasive, tantamount to accepting, along with Kull, that "there is no sensation, nor esthesis or poiesis without semiosis, and aesthetic process is their aspect, driven by semiotic fitting" (Kull 2022, 12).

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