

Hopeful monsters

Literary teleology and emergence

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Abstract

Taking poetics as its base, this paper explores emergence in a constellation of disciplines – semiotics, teleology, and the complexity sciences. In whichever field it is studied, emergence is always Janus-face. I argue that its two aspects, directionality and originality, arise from accidental patterns. Poets have always taken seriously the meaningful effects of coincidences, often attributing them to their Muses. This paper reverses that move. Rather than attribute the cause of coincidence to an intentional being, intentionality is shown to arise from efficacious coincidence. Here, as in Juarrero (1999), emergence is equated with intentionality. That is, unpredictably creative but also self-directed, emergents seem to have minds of their own, and the future of emergence studies depends upon naturalizing this mentalism. Using Peirce's theory of the emergence of grammar as a guide, I show how mentalism can be understood in terms of animating semiotic interaction, which depends upon accidental patterns.

Introduction

Artists, as such, are *intentional* beings, self-directed and creative. Literary theory was sent into a state of crisis when teleological selfhood and authorial agency were called into doubt by Derrida (1966) and Barthes (1968). Tempered by deconstruction and post-structuralism, a few theorists (Freeman & Hosek, 2001; Alexander, 2002; Fletcher, 2004) are now trying to reassess the notion of intentionality using concepts from the complexity sciences. The idea of emergence in particular enables one to redefine teleological behavior and intentionality. Appropriate to the area of literary studies, this paper takes a poetic-semiotic approach to understanding emergence that builds off of as well as supplements a scientific approach.

I'd like to stress, first of all, that an artist's claims about creative intentionality are modest. I do not argue that it entails a break with causality or special divine dispensation. Artists simply argue, as complexity scientists do, that creativity is possible because laws are generated by systems, not the other way round. This idea is quintessentially Peircean. According to C. S. Peirce, all lawful regularities are really just "nature's habits." If this is so, we cannot know natural laws prior to their appearance in systems, so the link between determinism and prediction, figured so memorably by Laplace's all-knowing being, would be a false assumption. At any particular moment, an author knows all forces that set a story in motion, and all positions of all items of which the story is composed. An author is very like Laplace's being, and so she is in a good position to interrogate his conclusions. Despite her full knowledge of the present, she does not know what will happen next before she writes it. Every invented detail can resonate unpredictably with existing details, creating new effective contexts. The new perspective changes the meaning of the events so far depicted, and sends the story in a new direction, culminating in an ending that had been inconceivable on page one. In the end, the author often recognizes "a figure in the carpet" as James (1896) calls artistic intention, which retrospectively appears to have chosen "every word," dotted "every i," placed "every comma" (p. 365).

The conditions of Laplace's fantasy can never be met or tested, such is the usual complaint, but the crucial glitch in the logic is more subtle, for, as Bergson (1910) notes – borrowing roundly from Scholastic arguments on the nature of an omniscient God who experiences past, present, and future simultaneously – any being who has complete knowledge of conditions *and* the laws that guide them would, in effect, have already experienced the fullness of time and would *know* the outcome but would not be predicting it. That is, the story would already be writ. Although Bergson's argument is specifically designed to question the supposed theoretical predictability of conscious states, he comes near the conclusion reached by nonlinear dynamics researchers who contend that if every state change in a complex system can have a different rule attached (Crutchfield, 2002), then Laplace's being, who, like an author during the process of writing, is confined to a particular place in time, could not be in possession of all the rules that would enable him to predict events at any future state.

Due to their experience with creative processes, artists are naturally receptive to the idea of emergence, and science's long resistance to it has been part of the cause for the separation of the 'two cultures'. Inviting reconciliation, Crutchfield has outlined what he considers the "theoretical frontiers" of the complexity sciences. He asks questions usually only of interest to artists, "What is meaning? What is function? ... And how do these arise when they are not originally present?" (Crutchfield, 2003). I will try to describe the poetic-mechanics behind the origins of new 'meaning' and 'function' and show how this process generates 'new rules'.

Constraints in art and freedom

This paper does not attempt to overturn the argument, determinism = predictability, by using its mirror logic, indeterminism = unpredictability. Instead, I argue determinism is not at odds with unpredictability and that emergence is not equal to indeterminism. Creative acts are defined by their lawfulness as much as their novelty. As is commonly and wisely thought, the arbitrary constraints of form (e.g., genre, meter, rhyme scheme, and grammar) often force poets to invent ingenious lines, and these inventions, in turn, tend to affect the form. Following Wittgenstein, we observe that although every move in the language game must be played by the rules, some moves change the rules of the game.

To argue for artistic intentionality is not to argue for absolute 'free will', i.e., contra-causal or supernatural behavior. Having an arbitrarily free will would seem to preclude self-*directed* behavior anyway. The definition of intentionality requires a notion of constraint as well, or else freedom has no meaning. Emergents must be similarly disposed. They must proceed deterministically from their histories, and they must redefine their histories by being responsive to patterns that exist only in large interacting systems and are only available from long perspectives.

Defining intention

The long and very rich history of teleology, the study of final cause or purpose, is a boon for literary/aesthetic theorists since it formalizes the appearance of intentionality by which we can describe an object as a work of art. Teleologists, like artists, claim the whole is greater than the sum of the parts because *telos* adds 'something more'. Historically, teleologists have represented their explanations with a reflexive series: parts ? whole ? parts or a cyclical series: A ? B ? C ? A. Most teleologists have thought of *telos* as a product of feedback, not as a cause separate from or in the future of the process it guides. Although many may associate teleology with Christianity and claims that nature is progressive and "everything works out for the best," during the nineteenth century, there was quite a bit of fruitful scientific work in secular teleology (by, for example, Karl Ernst von Baer, Johannes Müller, Carl Bergmann and Lotze Leuchart), focusing on embryology, rational and functional morphology, and cell theory (Lenoir, 1989).

Some familiar accounts of teleology have considered intentionality in terms of conscious, *linear* 'goal direction'. This unfortunate metaphor conjures up an actually existing material object, such as a target, that is spatially and temporally removed from the agent. This image encourages the fallacy of backward causation, and teleology becomes misstated as the investigation of who does what *for the sake of* what. I believe agency hinges on different questions: Can a fortunate end-state emerge that *cannot* be predicted from the states that precede it? Does this emergent property, therefore, require that some *internal constraints* be posited to guide the interactions of all that contribute to whole? Combining the insights of teleologists with complexity scientists, I define *telic* systems as those systems showing order that is not pre-specified and that confers an additional functionality on the system. Such a view of intentionality is, as Freeman (2001) has argued, distinct from notions of strictly *conscious* and/or *pre-determined* purpose and avoids the problems of Cartesian dualism.

Teleology can be a useful and extremely subtle tool for exploring what it means to create something truly new and yet meaningful. In particular, teleology has shown that intentionality has two distinct aspects: *directionality* and *originality*. *Directionality* is evident in self-organizing 'archetypes', from ubiquitous spiral shapes and target patterns to 'universal' grammars and 'strange attractors'. These patterns are neutral because they *result from* a dynamically stable whole; the patterns themselves do not function to maintain the whole. Upon first appearance, directional forms might be considered merely 'decorative art' in aesthetics or benign mutants in biology. In science, directional emergents have been dismissed as mere epiphenomenal side effects. In the 1950s, Belousov had difficulty publishing his results pertaining to spontaneous oscillating concentric patterns in chemical mixtures (Winfree, 1987). Had these merely pretty patterns been shown to cause unpredictable effects, they might have received more timely attention.

As novelist and lepidopterist Vladimir Nabokov noted, "eye-spots," directional concentric patterns on a butterfly's wings (comparable to Belousov's patterns), may scare off a predator that mistakes them for owl's eyes, but their usefulness is not the cause of their existence since they can arise without the gradual nudge of natural selection. Elsewhere (Alexander, 2003) I've argued, using Nijhout's (1991) research in support of Nabokov, that concentric patterns are likely to appear on a butterfly wings given the way pigment diffuses from a point source. Wing patterns are self-organizing attractors that can jump from one form to another with single or few mutations. Natural selection is not required to gradually shape 'eyes' into existence. They can appear suddenly, fully eye-like, and can immediately serve a reproductive function. When the 'eye-spot' does come to have an accidental functionality, then it has gained the aspect of *originality*; it has acquired a meaningful interpretation within a specific context.

Nabokov's non-Darwinian evolutionary theory bears resemblance to Goldschmidt's (1940) hopeful monster theory, which argues that one or few mutations can lead to great changes in form and/or function, some fortunate, some not. His idea was derided for it seems to depend too much on improbable luck. Luck often invites speculation about supernatural causes, but if one is of a more scientific mind, one can consider telic causes instead. Efficacious coincidence, I contend, is teleology's proper object of study. The image of a hopeful monster concretely illustrates the key aspects of directionality and originality in telic

phenomena, exemplifying as it does the fortuitous discovery of a meaningful function for previously neutral archetypal structure.

The distinction between directionality and originality is derived from Kant's conceptions of the aesthetic and the teleological aspects, which informed nineteenth-century arguments in biology between formalist and functionalists (e.g., Reichert, 1838; Owen, 1843). Formal causality involves a governing *eidos* as rational principle (e.g., harmonious proportions), and final causality involves a governing *eidos* as purpose (e.g., moral intentions). While directionality occurs when the individual elements of a *single* system each becomes synchronized with its immediate neighbors, collectively producing organized behavior, originality must involve *two* systems, one system being used by another.

If something is merely directional, like a spiral galaxy or any number of 'archetypal' patterns in nature, it may be beautiful, but it doesn't have the full intentional aspect that is so important in defining a work of art as art – or in defining an organism as teleological. Many abstract paintings seem merely directional to me, and (supposedly naïve) viewers may ask, What's the point? (which indeed may be the 'point'). In my opinion, art needs to satisfy this 'naïve' viewer's question.

If, however, a work exhibited much more originality than directionality, mistaking nonsense for sense, as in a dream, it would not be able to communicate a point. In James Joyce's *Finnegan's Wake*, "that 600-page crossword clue," as Amis (1999) puts it, every detail is poetically linked to something else, something idiosyncratic to the author. Amis observes that Joyce has little regard for the reader. In this particular work, Joyce's laws follow a singular logic, which the reader cannot access through the text itself. In my view, the audience must be able to sense both the directional and original aspects if it is to be interpreted as art, that is, without the intervention of artful critics. As I hope to show, noting both directionality and originality is as important in emergence studies as it is in teleology and aesthetics.

Directionality: Literary genres

Teleologists focusing on the directional aspect argued that there exist archetypes from which animal forms are derived resulting in 'variations on a theme'. Many genetically unrelated species appear to have been formed according to the same general *ground plan*: that is, many species' major organs have relatively similar distribution schemes or developmental homologies. Contra Darwinian evolutionary theory, these similarities do not necessarily imply a common ancestor or similar functional adaptations, but common rules guiding development. The burgeoning fields of 'neutral' and 'structural' evolutionary theory now contend that there is a relatively small number of structural archetypes considering the multi-dimensional space in which they evolve (Fontana & Buss, 1994; Goodwin, 1994; Crutchfield & Schuster, 2002).

Hence, there are marsupials that are strikingly similar to wolves, cats, mice, and squirrels (Goodwin, 1994). Likewise, similar grammars have arisen in completely separate language families (see Pinker, 1994, for a counter argument), and the epic genre has arisen independently several times in several different cultures. To regard these 'universal' characteristics or laws as teleological, as I see it, is to think of them as arising from the systems, *not* pre-existing them.

Literary theory benefits from the study of teleology for we find that many genres are directional phenomena, and a genre's universality may have less to do with fitness selection than with other constraints. Genres often emerge out of the interactions of various writers, all of whom follow their own local rules, but do not have a standardized set of rules to guide them. Certain behaviors are selected, not because they are more functionally 'fit': they don't necessarily work better. They are merely more likely because some sets of behaviors can be interpreted as the same.

In *Design and Chance*, Peirce (1883-84), in an effort to generalize natural selection beyond the biological realm, eliminates the need for function or reproductive advantage, and makes his theory apply to all complex systems, not just those capable of increasing their numbers through self-replication. Using the analogy of a dice game, he demonstrates how order can arise spontaneously because there are more ways to roll seven than two. The degrees of freedom are reduced by merging equivalent outcomes five and two, four and three, and one and six, which are each *iconic* signs of sevenness. A similar kind of situation seems to occur in the directional process of new genre formation, where narrative elements that are coincidentally similar might be used in a modular fashion to construct stories with different details but similar structures. While some genres are born from a single progenitor or template, as is said to be the case of Walpole's *The Castle of Otrano* (1764) and the gothic tale, it might as easily go the other way, the 'template' emerging from various stories. A folktale often begins when a king, parent, boss, or friend leaves home for work, war, trade, or entertainment, and an interdiction is addressed to the young hero left behind: Don't go into the closet, woods, courtyard, or etc. As a folktale morphologist, Propp (1928) classified tales according to the way they relate to an archetype, rather than an ancestral form. Any number of generically similar stories might arise independently and spontaneously through the directional process I've described. This is to suggest less mysterious or more politically neutral causes for 'universals' and 'archetypes', than have been proposed (Campbell, 1948; Frye, 1957; Boyd, 1998; Carroll, 2002).

With a few exceptions, genre fiction is notoriously unoriginal, that is, it is not particularly artistic. Although self-organization is often cited as an example of emergence of radical novelty, there doesn't seem to be true intentionality in mere directional forms of emergence (see Goldstein, 2001, 2002 for a related critique of the practice of equating emergence with self-organizing phenomena).

Originality: Phenomenal patterns

When an artist notes a self-organized pattern in his work (e.g., variations on a butterfly theme or a pastoral genre plot structure) *and then notices that it also coincidentally serves a function*, that is, he notices it has a new meaning within the larger context of the work, he is thrilled. It is for these moments that poets thank their Muses. A Muse is the artist's own intentionality becoming apparent. This section will focus on the original aspect – the function or meaning – of telic phenomena; in some case directionality may *not* be the cause of the form, i.e., the form may be purely accidental. I refer to such patterns as *phenomenal patterns*. Critics who interpret phenomenal patterns generally seek to identify the mechanisms behind the ephemeral *meaning(s)* of a literary work. Few can resist the temptation to argue that they are highly suggestive of an 'Author', an intentional being behind the text. Phenomenal patterns defy Barthes's (1968) argument against originality in *The Death of the Author* because one cannot attribute the function of phenomenal patterns to the forces of culture, language, or genre because they do not follow any known rules or regularities. Forster (1927) claims such patterns in *Moby Dick* give the novel its "prophetic" power. A coincidence (having to do with the word 'delight' that appears twice in unrelated circumstances which also involve the word 'destruction') seems to predict the demise of Ahab's ship. Kermode's (1979) term for a phenomenal pattern is an "occult structure," and he argues that the Gospel writers consciously employed them to make Christ's story more poetic and thus somehow more mysterious. Auerbach (1953) discusses "vertically linked figures," common in sacred texts, which imply an author who exists beyond the laws of time and space and who can poetically link events that have no local connection, e.g., when Moses raised his arms in the sign of a cross he prefigured Christ's crucifixion. Martin (1986) suggests the generic term, "odd textual conjunctions," to replace the many different terms in use. Dimmock (1997) borrows the term "stochastic resonance" from science.

A simple kind of phenomenal pattern is a pun, insofar as it suggests another meaning that reveals a more profound truth. Consider this pun on 'lie':

Hamlet: "Whose grave's this, sirrah?"

Clown: "Mine, sir."

...

Hamlet: "I think it be thine indeed, for thou liest in't."

Clown: "You lie out on't, sir, and therefore 'tis not yours. For my part, I do not lie in't, yet it is mine."

Hamlet: "Thou dost lie in't, to be in't and say it is thine. 'Tis for the dead, not for the quick; therefore thou liest."

Clown: "'Tis a quick lie, sir; 'twill away again from me to you."

(Shakespeare, Hamlet, 1601, V.i.383)

Making a pun amounts to making a paradigm shift, which produces a meaningful side effect. What is stable and meaningful in one context can have a different meaning in another. If we consider any individual thing out of its usual context, it becomes apparent that it has no inherent end or function. A virus can make a very different use of another system, a white blood cell, than the one for which it evolved. A viral appropriation of a pre-existing structure vividly describes a way in which originality can arise. The virus makes the white cells function for it by making their activities *mean* something different. I consider this a *creative* act insofar as it involves a distortion of the rules. If I write a 'to do' list, then I notice that it happens to have fourteen lines, as sonnets do, I can interpret it as if it were a sonnet. I can ignore the to do list's essential features and utilize a phenomenal pattern instead – the fact that it has fourteen lines. Finding new functions in this way involves what Peirce called *iconic interpretation*, an ignoring of differences and a noting of similarities. But this is a special kind of iconic interpretation. Making use of a side effect entails not seeing what is essential (pertinent to the creation/development of the object in question) and seeing what is not essential. In Darwinian biology, side effects are not specifically 'programmed in' the genes. More generally, side effects are patterns that are not pre-specified by the initial conditions. When a side effect is meaningful, it is a phenomenal pattern.

Another kind of phenomenal pattern is an echo. In *Hamlet*, Shakespeare invented 'Polonius' as a name for the king's counselor. Polonius sounds like Poland. Hamlet kills Polonius. Fortinbras, Hamlet's foil, attacks Poland. The echo seems intended to inform us about the way we are supposed to view Hamlet's actions vis-à-vis Fortinbras's. One can suppose that either Shakespeare contrived this pattern for some reason or it is an unintended coincidence, i.e., unintended side effect (Alexander, 1999). In literary criticism, one can never be certain whether one has discovered or imposed the interpretation of a phenomenal pattern.

Finding new meaning in this way is not dissimilar to the way that some suppose they can read divine intention in various coincidental 'signs' in nature, such as finding a dead bird on one's doorstep as one leaves to catch an airplane. As I have

already noted above, coincidences are especially relevant to the appearance of the original aspect of *telos*. Directionality can offer explanations for self-organizing patterns (e.g., various spiral galaxies that resemble each other) but not patterns that are merely coincidental (e.g., the big and the little dipper). According to Peirce, a resemblance can be governed either by a “real” law, indicating the intelligible regularities (habits, if not laws) of nature or by an “accidental” law. When an accidental law is found, a “synthesizing” subject “introduces an idea not contained in the data, which gives connections, which they would not otherwise have had” (Peirce, 1890: 261).

Peirce’s distinction can be linked to a distinction in teleology between *nonmentalism* and *mentalism* (Bedau, 1990), which I identify here with directionality and originality, respectively. Nonmentalistic teleologies are founded upon evidence of intrinsic constraints that guide and limit processes. That is, the stochastically interacting parts produce a lawful whole. Mentalistic teleologies are founded upon evidence that appears to necessitate a mind to arbitrarily link two different things – through some sort of coincidental similarity – which has some meaningful effect. In the remainder of this paper, I will apply Peirce’s concept of an “accidental” law to his semiotics in order to demonstrate how mentalism might arise in language or in language-like interactions. For the most part, I will be interpreting natural systems instead of poetic systems, but what I will be doing is very similar to what I do as a literary critic when I interpret phenomenal patterns. In nature as in literature, it is these kinds of interpretations that suggest the mind of an author.

Charles Sanders Peirce’s semiotics

If emergence can be compared to intentional behavior, it can because emergence is unpredictable and even inanimate emergent systems seem to have minds of their own. This is one of the reasons why we find emergence so compelling as an area of study and why others regard the interest as unscientific. What is needed, then, is a way to naturalize the appearance of ‘mentalism’ in emergent processes. In Peirce’s semiotics, very useful for these purposes, all interactions, including interactions between inanimate things, are considered forms of interpretation. Peirce (1894) classifies different sign relations according to whether they involve iconic, indexical, or symbolic interpretation. These distinctions correspond to his notions of firstness, secondness, and thirdness, respectively. The key to understanding emergence is using a triadic system precisely because it cannot be reduced to dyadic stimulus-response relations. Only a triadic semiotic can give a role to contextually dependent meaning in nonsentient systems, allowing for flexibility, unpredictability and, consequently, intentional behavior (Sebeok & Umiker-Sebeok, 1992).

The marks ??? are iconic of threeness and may be recognized as such without any prior learning. Following Peirce in the context of distinguishing between types of laws, one may say a group of stars that look like a big dipper is an *accidental* icon. A photograph of a person is a *real* icon. (In order to avoid unwanted connotations of ‘real’, I will henceforth use ‘nonaccidental’ in its stead). Above, I’ve used die faces as examples of icons, and I’ve mentioned how iconic interpretation must play a role in directionality: different signs may be considered essentially the same. Whichever kinds of signs happen to form a large class of equivalents, even if accidentally iconic, will have a greater tendency to be selected.

Iconicity involves not seeing differences between sign and object. It’s a kind of interpretation that doesn’t take much thought. Iconic interpretation can occur with a bird’s inattention to the difference between a camouflage moth and the bark on which it rests. Iconicity also comes into play in puns, as discussed above. Puns can be unconscious: one can mistake one thing for something that is similar. Puns can be entirely thoughtless. Examples of puns in the natural world are antibodies and antigens because the receptor sites happen to have a similar shape as the binding sites. Although the resemblance is accidental, one would not, in this instance, suppose that ‘synthesizing’ subject is necessary to link the two. As a result of the antibody-antigen selection process, the aspect of originality – a functioning immune system – appears.

While an icon is *similar* to the object of which it is a sign; an index is *contiguous* with the object it represents. It compels and directs one’s attention to something. In the natural world, indices mark a connection. A symptom is a sign of a disease. An axon is the index of the neuron. Such indices are nonaccidental.

In language, pronouns are indices that point to and establish the exact object. Words such as ‘that’ as in “*that* one” or ‘here’ as in “put it *here*” derive meaning by being linked to specific contexts and situations. Such indices are not physically connected to the objects they represent – not all indices are effects of their objects – some are only in some sort of resistance or reaction with their objects. Therefore, anything that is used to measure something else, or to get some sense of something else, as when a photon hits a particle, is an index of an object. I classify this latter type as an accidental index.

A symbol is a sign of an *arbitrary* relationship that has been forced on us through habitual exposure. First, we understand words as arbitrary signs of objects through the convention of language. We learn that V is the sign for ??????. Second, we learn *grammatical rules*, relationships between words. Once we understand the grammar of Roman numerals IV, we can apply the rules in novel situations. (We can even understand that ‘five’ is meant by the incorrect form of VX .) Words are in some sense accidental signs of the objects they represent, but the grammar (the intelligible regularity) that emerges from the relationships between words is a governing habit, if not law.

Arbitrary contexts and contextual change

One can see that iconic and indexical interpretations occur instantly: they do not require learning, but the situation is quite different with the symbol. It's a much more mysterious sign gained through habitual experience with things arbitrarily linked. It emerges out of icons and indices. Curiously, the symbol seems to be able to take special advantage of what I have been calling 'accidental', icons and indices, that is, icons that only coincidentally seem similar to an object (because of a side effect) and indices that only seem contiguous with an object (because of an arbitrary association between an object and a context). If an interpretation of an accidental icon or index occurs frequently enough, it becomes 'nonaccidental'. This is the fundamental principle behind Peirce's idea of natural law as habit. To make a connection with the Janus-faced aspects of emergence that I've been developing, if the interpretation of single accidental sign bestows an additional functionality on the system, we have originality; if numerous interpretations of accidental signs occur, we have directionality. The processes loops on: if the directional (self-organized) form then comes to serve a function, it has acquired a new aspect of originality, and on and on, ever acquiring greater complexity.

An application of Peircean semiotics to the study of emergents is easily made, for emergents have already been discovered to rely upon arbitrary or accidental associations such as we find in symbol use. Goldstein (2001) has urged emergentists to consider the order found in the *containers* of complex systems. The constraints imposed by the context of interactions become *arbitrarily* associated with the interaction. Thus, the process appears to be a type of symbolic interaction. In an effort to describe symbol use (and hence mentalism) in inanimate systems, I will examine containers of the chemical process of butterfly wing pattern formation, further developing my Nabokov-butterfly theme. Butterfly wing patterns have been characterized as archetypal in nature, that is, in the 1920s, lepidopterists (Schwanwitsch, 1924; Süffert, 1927) discovered a 'template' or 'groundplan' from which, they claimed, all variations are derived. We now understand the pattern formation to be self-organizing, and the groundplan is an example of an attractor. According to Nijhout (1991), two-dimensional models of wing pattern development require two substances, an activator and an inhibitor with equal distribution. The activator's by-products (i.e., its syntheses) will tend to increase their own production, but the inhibitor will neutralize the activator's by-product, resulting in a steady state. However, the steady-state behavior will go out of balance along the edges at the container boundary where the activator is in contact with the edge not with the inhibitor. The activator produces more of itself such that its neighborhood becomes made up only of other activator molecules. Above I mentioned that directionality results partly because iconically equivalent signs can form a large class (various combinations of die faces) which has a higher probability of being selected, but directionality also sets in because, as Peirce (1883-84) metaphorically puts it, the dice "are worn down in such a way that every time a man wins, he has a slightly better chance of winning on subsequent trials" (p. 220). What's been done before tends to be done again. In this chemical reaction, we see that it is the arbitrary boundary that constrains the interactions of the activator molecules, allowing habituation or sameness in the environment to set it. Activation leads to more activation. Exemplifying Prigogine symmetry breaking, activation along the boundary of the butterfly wing spontaneously increases, giving rise to differentiation, wave-like dynamics, and overall patterns.

Chemical reactions and the container can become arbitrarily associated with one another and this may be compared to the way a word becomes arbitrarily associated with an object, allowing habituation, eventually leading to grammar-like 'intelligible regularities' or self-organization. This analysis of an 'inanimate symbolic system' is just a first step, but I believe this is the sort of thing we should be looking at if we want to understand emergence in terms of language-like interactions.

What's missing in this example is insight into the generation of originality. As noted above, mere self-organization doesn't seem to satisfy the requirements of emergence *per se*; the self-organizing pattern must bestow an additional functionality upon the system. To understand the generation of radical novelty, we also need to look at contexts and constraints, but we need to widen the perspective to include two systems interacting with each other or one system in an environment. The self-organized pattern must itself become a sign that can be interpreted or, more precisely, *mis*interpreted.

Building on Cantor's example of radically novel number generation, Goldstein (2005) has noted that emergence must also involve following and *negating*, which opens up a space for *radical* novelty-not mere ordinary change. Rules must be simultaneously, yet unparadoxically, used and transcended. Deacon (1997) has reached a similar conclusion in his application (and, I would argue, *extension*) of Peircean semiotics in his study of the emergence of grammar in hominids. I believe that both Goldstein's and Deacon's arguments can be related to my thesis linking originality (i.e., radical novelty) and accidental signs. Accidental signs acquire new meanings (without breaking rules) when the context shifts: accidental signs can be imported and used in other contexts *because they are accidental*, i.e., not physically tied to the context of origin.

Deacon argues that other species may be capable of indexical and iconic interpretation – they even can learn a number of words – but grammar seems much more difficult: it requires a negation of what I call 'accidental indices'. As we have learned above, a nonaccidental index is a sign of a causal relationship; smoke is an index of fire. Deacon claims symbolic thinking first makes use of indexical associations by utilizing a *chance* contiguity rather than an inevitable one. The word fire appears in the context of the object fire, thus sign and object become indexically associated through repetition. The pseudo-indexical associations between a word symbol and a particular object gained by experience then have to be 'unlearned' in order to develop grammar, i.e., to understand the relationships between words. 'Fire' must come to represent more than just *that* fire: it also must iconically signify other fires or fire-like things: importantly, it also must be recognized as a noun. Once habituation has

set in with a pseudo-index, that is, a word has acquired conventional meaning, it may be imported to different contexts, loosely tied to its original context by memory, no longer contiguous with it. The change of context allows the possibility of finding a radically new function for the sign by following the symbolic meaning and negating the indexical association. This is precisely what happens to puns that change meaning as the context shifts.

The symbol is efficacious for abstract and imaginative thought because of its loose ties to the world, its arbitrary connections between words and objects. The decoupling of the word-symbol from its false indexical associations or the particular experience in which it was learned enables subjectivity, a decoupling of one's experience of things from the things themselves. Subjective meaning entails the symbolic grammar of one's experiences, i.e., things are understood only by the way they relate to other things.

To the extent that language is grounded, it must make use of nonaccidental signs. But the power of language to self-organize and create, I argue, must arise from the utilization of chance similarities and arbitrary contiguities. The mysterious power of the symbol to generate mentalistic interactions appears to come from its use of *accidental* icons and indices, which, when they appear in the literary realm, I call phenomenal patterns.

Conclusion

Although teleologists were on the right track in pursuit of the mysterious causes of emergence, they allowed the label 'final cause' to substitute for a true understanding of the mechanics, involving efficacious coincidence of similarity or contiguity. In this paper, I set out to answer the question of how the emergence of new functions and meanings can generate 'new laws' and thus make artists capable of both directional and original behavior, i.e., intentionality. I have tried to show that new laws result from symbolic sign relations that make use of accidental icons and indices. Although my understanding of intentionality may be linked to luck, I do believe that artists can claim responsibility for meaning that arises in this way precisely because artists, insofar as they are worthy of the designation, are keenly aware of the way phenomenal patterns function in their work, and they intuitively understand the laws they generate.

Notes

In keeping with *E:CO*'s promise to be cross- and trans-disciplinary, *E:CO* is offering "Hopeful monsters: Literary teleology and emergence" a paper that simultaneously involves literary theory, artistic creativity, intentionality, evolutionary biology, teleology, semiotics, and emergence. This hearty brew combines the best of cross-disciplinary research while at the same time managing to transcend any particular discipline in its inquiry into central features of complex systems in general. Moreover, it serves to not only reframe critical ideas in each of these areas from the point of view of complexity studies, it accomplishes the reverse reframing of critical issues in complexity theory. In its wake, we find a bridge unifying what were previously considered separate realms: art and organism; will and spontaneity; creativity and evolution. It is for these reasons that we are including this paper under the Philosophy Section.

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