

Evolution: Systems and Novelty – an Interdisciplinary approach

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Abstract: *In this essay I argue that evolution can be thought of as both a slow progress of development over time that settles on a definite form (or system) which then repeats itself, as well as, a highly creative, playful and unpredictable activity. I have argued this approach rather metaphorically, borrowing terms from art, mathematics and science, in order to apply evolutionary thinking in broad and general terms, and in the process link the natural and the cultural, the sciences and the humanities. This interdisciplinary framework suggests an epistemological unity.*

Keywords: *system; novelty; evolution; math; science; art; culture*

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I. Introduction

In simple terms and with brevity, one may define evolution as the progress of a species (though the term can apply to a wide field of application and meaningful usage) over time in a process which improves the adaption of that species to the environment, endowing it with certain properties and functions in order to proliferate. The manifestation of this process is a species of a certain bodily form that can perform in certain ways enabled by internal mechanisms. Evolution toward a successful species includes manifold aberrations, many of which are superseded or become extinct.

How precisely the mechanism of evolution functions accords with Darwin's "survival of the fittest" and adaptations and also Dawkin's argument of the so-called selfish gene. Accordingly, nature is seen as competitive, violent and unrelenting. This is due to the fact that a system or a set of definitions that allow for a language, is such that because of the rigors of a language, the system allows for either sense or nonsense and when it happens upon the former (a highly evolved species), it repeats that pattern in great variety and settles on a type.

On the other hand, nature is not a restraint and defined by the system. There are moments of breaking away from the system or definition, of a highly unexpected and creative quantum leap. For example, humans were able to free their arms much as the primates do, both have intricate dexterity and use of the hand, but humans evolved a more sophisticated brain and erect stance, thus become the dominant species on earth. One could argue there are numerous intermediate steps to get to that point, cultured over hundreds of thousands of years, and that nothing new actually occurred as such at any point in the slow march of evolutionary time (and one might say the same about the formation of galaxies, stars and planets or the growth of a plant for that matter).

However, I will argue in this paper for the combined functionality of both a system's approach (using a language) and novelty and creativity (breaking the form of language to elicit new meaning). I begin defining the operation of the system and the creative "mechanism"; then I describe the intermediate steps as one of play and finally apply this dual approach (systems and the creative) in terms of mathematics, science and art, with a view to understanding evolution as both procedural and dynamic. I conclude with the idea that this theoretical approach implies the necessity for seeing evolution and the exasperating effulgence of life as beautiful not simply as a violent and a-moral search for form and function and domination over the environment, but also a gentle stirring that is unpredictable, creative, collaborative and beautiful.

1. The definition or system: settles on an iteration and repeats

The system defines the function of all components in themselves and in relation to the rest of the components allowing the system (body, language, machine...) to function optimally if it's a good system, that is, one that performs certain functions, does not self-destruct and can propagate.

In evolutionary terms, the genome gives rise to the phenome. But the possibility space for what might occur is astronomical. Nevertheless, there is a procedure, something linear and logical, the carrying out of a program, that occurs.

Once a good solution is found, the program halts and repeats itself. Hence one gets eventually 8 billion humans and countless more animals, plants and grains of sand. The general evolutionary results stand, regardless of nuances in the intervening swath of time: There are animals, birds, fish, and humans. Of course, the elements as well (earth, water, fire and air). One could break down the evolution of these overarching categories (definitions, system, language, bodies {form}...) into sub-categories and systems (the construction of the body that enables it) and one could also argue that in their seminal oneness that harps back to the big bang oneness, all such categories evolve out of each other, yet there is a specific divide and thus these overarching categories. These systems are victorious, as it were (like natural numbers, regardless of the apparent infinity between each such number).

It would appear then that one could logically (with sufficient data) explain the inception of all things (from cosmology, to physics, to chemistry and to the life sciences in general) as a slow sequence of events, relationships, interactions that led to the evolution of these specific systems, and that a procedural knowledge of this accounts then for their existence and the continuous iteration of this system within confines of the universe, galaxy, earth, human beings, animal, bird, fish and plant (life). The system is preprogrammed, plays itself out and while slight modifications will occur – evolution been in motion at all times – it is unlikely to deviate from such known categories as enumerated (some animals though run the risk of extinction and one can analyze human history in a similar vein / certain plant forms may die out / the earth itself may undergo huge temperature variations which might set in motion innumerable changes in human, animal and plant life).

Nevertheless, the system is generated according to a few rules (its grammar if you like) and though one can say a great many things, the system is dominant (Just as an English speaker cannot understand a French speaker, so it is the system that precludes understanding). In a parallel fashion, these basic categories of evolutionary species development remain separate and evolve within set parameters, like a computer that has been programmed within the limits of its language and form. Once programmed it can perform certain operations, and if successful, it obtains, and endlessly repeats itself (practically all humans share almost identical body wiring and so on) in general, and even though individuality and differences within the species certainly exists, the overriding system subsumes nuances and differences. I am not the next person, and that person is not me, but we are both human beings. The universal concept – the evolutionary system that gives rise to the general categories – overrides, in its abstraction, particularities and idiosyncrasies. From a far distance in space, the earth is almost round and bluish – all other details fades.

2. **Novelty:** breaks the system/language

Discovery, invention, inspiration are writ as much within the human psyche (as a product of evolution) as they are embedded within evolutionary development itself. In this sense, the system or language does not act as a limit but allows for new languages without the necessity of a universal grammar or underlying language – it is a moment out of no-where akin to the inspiration of how to harness fire or electricity; to make a wheel; agriculture; mechanics; art; language itself and so on. In the same way, species unfold apparently linearly with slow progress – one appendage then perhaps two or more; but sometimes quite suddenly matter evolves something spectacular like the eye or the fusion of elements that create water; or the giraffe's elongated neck to adapt to nature and yet supported by an incredible strong framework of bones – all these are creative shifts that determine a new tentacle in the arm of evolution and have arisen seemingly from no-where, just as one might describe the creative *aha* "moment".

In this sense, the possibility of a paradigm shift may emerge. Nevertheless, there are always still general categories. The emergence of say jazz, or reggae are obviously creative junctures, but they still form part of a system called music. And so, with all the arts and sciences – creativity evolves within disciplines and sub-disciplines. And if it's useful enough, this new direction persists and becomes a norm (a system) until new inventions and discoveries, that is new uses of language, new forms with evolved apparatus and functions.

Thus, novelty itself exists within the system, while the system is only as resilient as it allows and accommodates creative evolution. Expressed in other words, one might say developing one's vocabulary allows one to be more precise about what one thinks and feels. In a self-same manner, lions evolved sharp teeth in order to survive (actually teeth were more developed in the dinosaurs or saber tooth tiger) and a torso that can twist, turn and run fast, but this was preceded by a long process of refinement and as the variety of forms expanded, nature settled on the most optimal solution. Is this creative? I would say in the affirmative and this is so as although the process appears slow and laborious, at very poignant junctures there were quantum leaps that result in today's animal that we denote in English by the word "lion".

3. **Intermediate stages:** play

We can all understand what is meant by the word and idea of "process". Evolution is a process where something simple becomes increasingly complex and sophisticated. In order to arrive at what I have called definitions or a system, there are numerous intermediate steps, links in the chain that only after much effort, trial-and-error; creative shifts, finally arrive at a given overarching definition/system (body).

Yet the important thing about process and evolutionary processes specifically, is that it is not only linear or logical, but also organic and surprising, with many forms falling by the wayside, dying out or been consumed by the environment. Only a few survive. From that pool a stronger chain is established. This apparently a-moral process is not logical and simply programmed, but creative play, where a “mistake” could even become an answer, and an absurdity, a reality.

The system has fun with itself. Huizinga defines humans as *homoludens* and it is human playfulness that leads to cultural invention and expression and relationship between people and in relation to nature as a whole. This is essentially fun or at least a prescribed set of manners and a way to mediate between the known and the unknown. Evolution itself is like such a cultural exchange where the natural order tests different parameters, in often unexpected ways and these finds a certain order (a cultural product) and settles on that (conventions, societies). This occurs because learning can occur and as the system learns so it weens out poor results, continues to play, improve its solution-driven ability and finally stops when environment and creature are in harmonious balance.

4. Application of systems and novelty:

5a) Mathematics: Set Theory - properties belonging to a definition; the universal and empty set = novelty

Set theory is a good analogy for evolution. Elements of a set are part of that set because they all share the same properties and are therefore members of that set. Shared traits could lead to overlapping sets; exclusive traits to definitive species. In this case one might say “set” equates to “system” (or defined form).

Yet the inventiveness of the universal set and the empty set, although themselves defined, transcend the limitations of the system: the former includes all sets under consideration and is not in itself a set and the latter are within all sets but includes no elements. This is akin to the overarching definitions – the absolute abstraction of the notion of “animal” includes all life forms of a certain kind and yet not one specific item (species) alone. Its aloofness, if you will, subsumes a myriad of species (elements) within one set, while itself been free of any subset of species and also allows enough flexibility for further evolutionary development without the notion of “animal” losing definition. In the case of the empty set, this could refer to species not yet existent but potentially could appear on the stage; it allows for the possibility of further iterations within all sets (systems, species).

Thus, set theory encompasses both a systems approach – combining like elements together – and novelty – levels of abstraction that either contain all sets under discussion or a set that contains no elements, allowing for constant invention and newness.

5b) Science: genome leads to phenotype

The scientific method can boast an uncanny ability to pierce beneath surface in order to find the “hidden” mechanism that determines the outward form, the ability of that entity to perform in a certain way and the manipulation of entities (animate and inanimate) to behave in certain ways.

The underlying mechanism of evolutionary growth amongst species development is the internal scaffolding – the genetic code, an algorithm that endows such an entity with certain capacities and bodily form that allows for the expression of such capacities.

In this way, scientific endeavor grants explanatory power or knowledge of how evolution works and can model that digitally, numerically and empirically. This means that the surface is a sign that maps onto deeper structures: a set of instructions.

Science uncovers the system and pieces its mechanism together in a logical narrative. On the other hand, it also models a system that can learn and therefore evolve new capabilities and innovative solutions that transcend the “programming” or limitations of the DNA. For example, a short person may think himself weaker than a tall person but may devise special techniques that enable him to overcome a taller adversary.

5c) Art: formal aesthetic play, idea assumes form

Art is the pinnacle of aesthetic considerations. Regardless of idea, concept, meaning, interpretation, social relevance; ideological positioning and so on, it is essentially a surface of some kind within the domain of fine arts which today also includes performance art, new media and installation art. Now this surface is itself an aesthetic phenomenon regardless of (or even in spite of...) the extra-aesthetic.

Art is an excellent model of evolution in its fine tuning of ideal form, of the aberration or distortion, of continual play, of invention. The creation of a new style (aesthetic) is an evolutionary quantum leap that repels previous iterations and creates a new appendage, as it were. Hence modernism – whatever the post-modern revolt – is actually a moment of high creative excellence in the forging of new methods, meanings and imagery (abstraction, expressionism, cubism, de Stijl etc.).

Alfred Barr considered formal evolution in art as one of scientific accuracy and argued for a linear and logical approach to the history of forms and styles in art, where abstract art is the apex. Of course this is flawed – there is no single narrative, but rather a hodgepodge of possibility, a soup of great potential with many elements and many possible solutions, and abstract art is but one style amongst many, rather than necessarily the

apex of formal artistic (re)volution (in its inception it is, but not once it itself becomes a system). But the genesis of art on the cave wall is the great well spring and the most powerful *aha* moment naturally- culturally, while all else is species of that initial awakening. It is like the sudden movement of life forms from the waters and oceans to land and the ensuing formation of totally new kinds of reptilian creatures roaming the earth and later, mammals.

II. Conclusion

In this essay, I have argued for the combined linear and slow development of species over time which at the same time is punctuated by creative moments from “no-where” akin to a paradigm shift. The essay has explored such themes in relation to an interdisciplinary framework including mathematics, art and science. While I have argued in general and broad terms, I think this philosophical reflection forms a solid foundation on which to think about evolution as both natural and cultural and as encompassing an application to a broad range of disciplines, in effect forging a kind of unity between the arts and sciences. In this way, one might speak an epistemological unity, rather than different languages (systems) that appear to have no connection to one another. Such a vision, if you will, suggests that nature and culture are intimately linked.