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Understanding irreducibility in semiosis via the image

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Abstract. This paper will start by explaining both the nature and importance of irreducibility in the process of semiosis. Specifically, it will demonstrate how this concept is necessary to Peirce's triadic approach to semiosis, Uexküll's 'functional circle' and Lotman's 'creative function' in human meaning making. These models will then be further elucidated through the non-semiotic lens of Bergson's concept of 'image'. All of these interrelated concepts of semiosis, including image, will then be explained via a novel, buildable and testable technology, which will ground semiosis in a physical process involving self-biasing circuits immersed in their own shared milieu of noise. Based on these arguments, the paper will conclude that semiosis can be understood as an irreducible image. This novel approach to semiosis can transform how the process of learning is understood and taught.

Keywords: irreducibility; Bergson; image; translatable; untranslatable; continuum

The question of irreducibility in semiosis

Whenever contemplating semiosis, say from a Peircean perspective, it is tempting to think that his Firstness, Thirdness and Secondness are discrete phenomena. This temptation further considers such phenomena happening in sequence: Firstness is first; Secondness is second; and Thirdness is third. And, in some of Peirce's notes, this may seem to be the case. This is true for cases of degenerate semiosis that only entail one of these, as with Secondness in digital computers, which will be discussed further below. However, as many semioticians (CP 3.422; Favareau 2010; Pattee 2001a) have noted and as will be argued throughout this paper, veritable semiosis entails the irreducible and simultaneous existence of Firstness, Thirdness and Secondness.

This means that these three phenomena are both distinct from, while interdependent upon, each other, *simultaneously*. A phenomenological example is

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the human perception of magenta. Magenta is a colour, for most humans, that is both distinct from and dependent on the perception of blue and red, again, simultaneously. Some, however, may argue that the experience of magenta is not actually distinct from red and blue: as red and blue are experienced, either in parallel or in very close succession, the "phenomenon of magenta" is merely an epiphenomenon, a kind of illusion (Dennett 1991). This stance allows one to believe in a kind of reduced or ersatz "perception" – and therefore, per the central argument of this paper, an *ersatz* semiosis – in computational terms, whereby there exists some homuncular arbiter (e.g. the software program) able, via some *a priori* algorithm, to register this illusory "magenta" when red and blue co-occur and are registered by a machine.

This paper, on the contrary, will argue that – in order to understand veritable semiosis – the veritable human experience of magenta must be understood as a fundamentally distinct semiosic phenomenon. This is true even as magenta simultaneously depends on the co-stimulation of red- and blue-sensitive cones in the retina of the human eye. Given this, magenta is not reducible to the mere summation (or concatenation in computational terms) of two other discrete stimulations; magenta is a fundamentally higher-order semiosic phenomenon: a sign composed of, but not reducible to, other signs.

This understanding of perception is largely inspired by my education as an architectural designer. As master's students in a studio-based curriculum, we were taught – through a deliberate process – that the successful design is discovered by exposing oneself to all the design constraints and opportunities. Learning the discipline of design is learning to sit with all these, often contradictory, design parameters simultaneously in one's mind. Sights, sounds, textures, temperatures, form and aesthetics came disparate with municipal codes, structural requirements and construction standards into a singular and buildable design. The process was not about reducing the design to any one of these constraints or opportunities, or even just a handful. It was about putting oneself into a practised set of circumstances that created the psychic space for an irreducible solution, i.e. *image*, whereby any one design choice facilitated many of the design goals simultaneously and synergistically. We were taught that this was a kind of *phenomenal transparency* (Rowe, Slutzky 1963), analogous to, but not the same as, the literal transparency via panes of glass. This is a subject unto itself and beyond the scope of this paper to treat fairly.[2] Nevertheless, for context, it is notable that this concept of transparency

[2] As part of the collection *Learning in Transition*, this pedagogical tool, which is largely confined to studio-based architecture curriculums, can transform other curriculums interested in cultivating students' intrinsic creative powers.

from design theory has inspired innumerable architectural curriculums and also inspires the arguments made for both irreducibility and image in this paper.

The significance of these points is not limited to colour perception, the architectural design process or Peirce's metaphysics. As will be illustrated throughout this paper, this idea of irreducibility is central to understanding all sensory perception, organismal interpretation and action, which always entails complex coordination in both organizing one's thoughts and performing ostensibly simple routine actions. As will be shown, even the simplest of perceptions, interpretations and actions will have involved quite complex semiosis that must transcend the received mechanical metaphors. Because, in one of its simpler characterizations, semiosis entails signs that must be both about themselves and not themselves, simultaneously, as explored in Howard Pattee's *epistemic cut* (Hoffmeyer 2008: 93; Pattee 2001b). Otherwise, the sign cannot have content and meaning at the same time, and we fall into infinite regress trying to resolve this self-imposed dichotomy.

This dichotomy – necessitated by our inherited metaphors – is a paradox. But, as with all such paradoxes, it is merely an *ostensible* contradiction, when, in fact, its resolution points to a deeper truth; semiotics, as a discipline, is well situated to resolve this pervasive paradox. In addition to Peirce's triad (Peirce 1992), consider, for example, Juri Lotman's concepts of 'translatability' and 'untranslatability' (Lotman 1990) – together and irreducibly referred to as '(un)translatability' – or Jakob von Uexküll's 'functional circle' (Uexküll 1926, 1982; Hoffmeyer 2004: 79), whereby action and perception continuously exist in parallel. In both of these cases, we again have necessary irreducibility.

Lotman (1990: 15), for instance, argues that translatability and untranslatability must occur simultaneously "each to different degrees" for there to be the making of meaning in human culture. Kalevi Kull (2019: 226) similarly argues that Uexküll's functional circle, sometimes mistaken as a "cycle", is better understood as a *circle*. Outside of biosemiotics, the physiologist Denis Noble (2022: 5174), in the context of cellular dynamics, uses the same argument for a "simultaneously active ring, not a one-way cycle". This subtle, yet powerful, distinction implies that the existence of action and perception co-occur instead of a sequential loop where one causes the other in discrete sequence. A *purely* sequential understanding, again, introduces an infinite regress, because somehow both action and perception must be about each other. There is some feedback, but it is still not an exclusively sequential cycle, whereby each phase is mutually exclusive of the other.

Arguably, the result of this feedback is the "New Circle" in Uexküll's diagram (Uexküll 1926: 157). Nevertheless, this does not necessitate that Uexküll's 'action

organ' must wait for some discrete time step of perception of his 'mark organ'.[3] Again, to insist on this discretely sequential understanding is to invite a logical regress, because how are all these distinct – and often contradictory – processes resolved into actionable interpretations, which are about many diverse things at once? Invariably, without a resolution to this question, the homunculus of the external human observer is projected into our inherited two-dimensional diagrams. However, as will be argued throughout this paper, this only begs the question of how philosophical *intentionality*, or "aboutness", is at all possible.

This paper will offer an answer to the above question, but this simultaneously distinct and interdependent "answer" necessitates a tension in the semiosic system. This tension is mentioned by Lotman over thirty times in *Universe of the Mind* (1990), whereby he explicitly discusses how (un)translatability or (in)compatibility are necessary for meaning making. It will be argued that this irreducibility is also the case for Uexküll's functional circle and Peirce's semiosis. However, as an initial illustration, it can be more easily explained in Lotmanian terms.

Consider translatability: if two systems translate each other perfectly, they would only be perfect copies of each other. Now consider untranslatability: if these two systems could not translate each other at all, no communication would occur.[4] Either of these "extreme terms" (Simondon 2020: 36) in of themselves will instantiate *zero* semiosis. Lotman, in contrast to these mutually exclusive non-semiosic modes,[5] understood how each of these tendencies must co-occur (Lotman 1990: 15). In this more complicated and ambiguous case of semiosis, translatability is productively problematized by untranslatability. But these partial

[3] As will be argued below, biological time, or duration (Bergson 2010), will be shown to be the emergent result of this irreducible circle. There is no externally imposed time, as in seconds.

[4] The overall project, of which this paper is part, does not presuppose semiosis. It endeavours to explain semiosis ontologically. As such, the "systems" imagined here are not semiosic, because they are the only phenomena that can entail the extremes of either perfect translatability or untranslatability. As this project will attempt to demonstrate, systems that are, in fact, semiosic embody (un)translatability: the irreducible ratio of translatability and untranslatability continuously and simultaneously in tension.

[5] In veritable meaning making, i.e. semiosis, there are two tendencies in tension with each other: for example, compatibility and incompatibility or translatability and untranslatability, "each to different degrees". When a system's "degrees", e.g. ratio of translatability to untranslatability, collapse into purely one or the other, then semiosis will have certainly collapsed, and these terms do not make sense anymore. Actually, semiosis will have likely collapsed before these extreme scenarios are reached, but – given the indeterminate nature of semiosic systems – this cannot be predicted beforehand. Nevertheless, we can be 100% certain that if it is completely one or the other, as in exact copying in computers, zero semiosis is taking place intrinsic to that system *per se*.

mistranslations create the *space* within otherwise perfect translatability for novel interpretations and, therefore, meanings. Arguably, this is Uexküll's 'new circle' and Peirce's 'endless semiosis' (CP 1.339). And, as will be discussed below, the novel *space* created via Lotman's tension will resolve the paradoxical nature of semiosis and also the uncanny capacity for living beings continuously to enact arbitrarily complex perceptions, e.g. magenta, and actions, e.g. behaviours animals routinely do to survive in their indeterminate and complex world.

But, again, how is this possible? How can the process of semiosis be both about itself and not itself, simultaneously? For example, how can the living organism be a distinct self? Paradoxically, this contiguity of being is only possible if *the living being constantly becomes other than itself to some non-trivial degree*; observing development in any living creature makes this point clear. In a very Heraclitean way, we must change in order to remain the same (Morin 2007: 12). Peirce's notion of 'habit'[6] captures this idea, and his insistence on a continuum (CP 6.138, 6.202) is a definitive contribution to explaining how this is possible. These ideas are explored in considerable depth in Bacigalupi 2025.

This paper will build upon a concept from outside of semiotics to address the questions above: 'image'. This particular concept of 'image' is developed in Bergson 2010 and then in Simondon 2025. The author's project, summarized throughout this paper, has also developed the idea of 'image' independently since 2011 (Bacigalupi 2013). It is important to clarify that this concept – as envisioned by Bergson, Simondon or the present author – is not to be confused with the colloquial idea of 'image' in its more familiar representational or graphical sense, e.g. a static picture in any physical medium. On the contrary, 'image' is continuous process in an infinite possibility space, i.e. an operational space of possible dynamical states, as will be explained below.

The next section will describe the nature of image, as a source for novel Peircean habits, Lotmanian meaning and Uexküllian functional circles. The third section will illustrate how Turing-equivalent computers do not entail image and present a novel machine that is designed to entail image. And the final section will build off the irreducible image described in the second and third sections to address the questions introduced above more rigorously.

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[6] See: West, Donna 2015. The call to dialogue through habit. In: Bergman, Mats; Paavola, Sami; Queiroz, João (eds.), *A Digital Companion to C. S. Peirce*, available at: http://www.commens.org/encyclopedia/article/west-donna-call-dialogue-through-habit.

Image

For both Bergson and Simondon, their notion of image is the basis for imagination and any novel conception (Bergson 2010; Simondon 2023), whether conceived by any sensory modality; internal dialogue and visualization; or any affective experience, like feelings and emotions. This image, while entailing the afore-listed conceptions, simultaneously contributes to resolving the many paradoxes of semiosis that, more than not, remain unresolved in legacy disciplines, such as biology. For example, in addition to the self/not-self paradox, other related paradoxes are embodied: past, present and future; inside and outside; here and there; the individual *vs*. the collective; etc. By looking through the lens of this processual understanding of image, it is possible to conceive of a resolution to these paradoxes.

Before being exposed to semiotics or Bergson's idea of image, the author – having practised architecture professionally for two decades – understood the paradoxical dilemmas above from the perspective of creativity in humans. The question arose in the early 2000s of just how such creativity in living beings was remotely possible, and a concerted research project to rigorously answer this question ensued (Bacigalupi 2013, 2022, 2023; Bacigalupi, Favareau 2023).

The principal offering of this research project is a realizable implementation of both image and, to a significant degree, veritable semiosis itself. To describe this entire implementation is beyond the scope of this paper. Nevertheless, to make the case outlined above, this paper will focus on an often-ignored aspect of this implementation: image.

Imagine being immersed in a medium, such as air. There is no light, only darkness. However, there are sounds that permeate this medium of air. As a continuous medium, sound waves propagate to fill this imagined space. Because it is a continuous medium, *innumerable* waves can superpose with each other to create ambient noise. In fact, this noise can be composed of an infinite number of distinct waves. The nature of the continuous medium places no limits on how many diverse patterns can be superposed. This, for our purposes, is Peirce's *continuum* and the basis of his Synechism (Peirce *et al*. 1998: 203; CP 5.4, 6.202): the capacity for innumerable signs to potentially be about each other.

Now imagine that the sources of these waves are individual nodes that are also immersed in this space. Like Uexküll's 'tones' and 'chimes' (Uexküll 1982: 34), these nodes are diversely sensitive to distinct and constrained ranges of wave frequencies that permeate the space.

A more accessible analogy is that of a group of musicians, like a symphony or jazz improv group. Each musician moulds the acoustic space among them.

This acoustic terrain is the superposition of each musician's musical contribution. Simultaneously, each musician hears this superposed terrain; each musician's behaviour both moulds and is moulded by this acoustic terrain, continuously and simultaneously. More pragmatically, this project is interested in how a novice ensemble of musicians, no matter their genre, will start out by creating more noise than music. Then, with practice, the group of musicians, via the shared medium of air they co-mould, will get better. This project endeavours to answer this question illustrated by the analogy. The image is both the relatively ephemeral patterns in the air among them and the behaviour of the musicians, simultaneously.

There are many notable attributes of image. For example, the number of possible patterns is limitless; these patterns can be arbitrarily distinct and related, i.e. arbitrarily complex; and they constantly develop based on the exchange between each musician and their shared common medium of air.

One can sit in the middle of a symphony, with eyes closed, and feel the music. This music is individuated into melodies, harmonies, beats, phrases, etc. Through a reductionistic lens, music can be interpreted as individual notes, but it is important to remember that, in the average listener, these notes bleed into chords, which bleed into musical bars and phrases. This is the crux of *individuation* (Simondon 2020). Each distinct sympathy between the musicians and their shared moulding of their shared acoustic terrain is variously distinct and inter-related, simultaneously. It is a mistake to think that, throughout our human development, we first learn discrete notes and words, only to string them together sequentially into music and sentences later. No, through childhood development, we first hear the prosody and rhythm of music and speech as a relatively low-resolution whole (Deacon 1997). In time, we learn to discriminate the pieces; this capacity comes *after* we conceive of a more cohesive ebb and flow of energy patterns. After this, in turn, we can reassemble the discriminated pieces into novel configurations. Our adult analytic minds then erroneously impose this order of causal operations on the more fundamental – and therefore less conscious – semiosis.

The image, however, is primarily a unified "film" (Lotman 2005[1984]: 207) of noise with infinite possibility. It is through countless action/perception circles that distinct aspects of this infinite potential are elicited by semiosic systems, such as ourselves. We can think of this noise as the literal noise of untrained children given musical instruments and told to play. This inevitable cacophony can be understood as a useless state that must be overcome through training. Of course, the question remains in all biology and semiotics of how this transition is at all possible. The answer is that this ostensibly useless noise is the *necessary* precursor to emergent habits, such as music and language.

The children have a shared object that they simultaneously generate and respond to. This noisy image is both their individual and collective behaviour, simultaneously. In time, each of their unique sympathies is resolved into more complex patterns than each pattern alone. This complexity is exactly because of the so-called noise they share, because this noise – which is the physical manifestation of a shared continuum – has an infinite capacity for patterns of superposed patterns: again, remember that the medium of air, for example, can instantiate a truly infinite number of patterns composed of arbitrarily many simultaneously superposed patterns. The children, over time, are merely constraining what patterns they want to emphasize; these constraints on the infinite potential are analogous to Peirce's *abduction*: a guess at what the collective can agree is an aesthetically pleasing response to all of their shared behaviours.

But this capacity to express oneself into a shared space – and to have that space reflect what each is contributing simultaneously – is *impossible* without a shared continuous medium. This medium is a critical aspect of image, and what is missing in contemporary semiotics. It is actively resisted by most biologists and semioticians alike, because to embrace image is to stand on the edge of the abyss, which risks descent into unregulated chaos. As such, this resistance to image is completely understandable; to conceive of the generative noise that permeates semiosis is to stare into the sun. There is no circumventing this uncomfortable aspect of semiosis, insofar as one is really interested in its ontic nature. Semiosis is the resolution to its own self-generated problematic: diverse sympathies vying for dominance via their shared image creates the potential for sparse order to emerge in this shared noise. However, without the shared noise of the image, there is no way forward for the collective tension.

Via the rare constructive interference in the noise, the image has emerged as a literal medium for the collective musicians in our example to harvest this sparse constructive order. In Gestalt terms, rare *figures* of constructive order emerge in the *ground* of noise. This rare and fleeting order re-*forms* the musicians; this is in-*formation* and the capacity to increasingly discern ever more complex patterns in their shared noise. How this is rigorously possible is described in detail in (Bacigalupi 2013, 2022; Bacigalupi, Favareau 2023) and in the next section. The purpose of this second section is to provide an intuition of image, as a foundational aspect of actually existing semiosis. The next section will present the schematic of a novel and buildable machine able to implement and test for actual image.

Implementing image

Contemporary machines have no image; their functioning is completely reducible and therefore they have no Virtuality.[7] This lack of Virtuality means that the machine does not problematize itself, as in the example of the architectural designer. A creative power intrinsic to Virtuality is the capacity for innumerable perceptual, conceptual and emotional images to superpose in one's mind, each being at least partially transparent to the others. It is from this irreducible disparation, or "noise", that the image can emerge. On the contrary, centuries of human effort have endeavoured to make our machines noiseless, perfectly accurate and predictable; the logical bit, in its mutual exclusivity from other bits, has zero transparency. Noise is the precondition for this productive transparency. However, any such noise in our contemporary machines indicates a broken machine for today's engineers. But, again, without this noise there is no image and without image there is no way for the machine to transcend itself and its maker.

This can be intuitively understood via our musical analogy above. Imagine being inside the machine. However, instead of sitting among musicians and listening to their shared "music", there is silence. The electrical pulses sent from one transistor to the next in the machine are, in the functioning machine, perfectly salient, perfectly stable, perfectly controlled and perfectly translatable. What energy is emitted into the transistors' shared milieu is only the waste heat of the digital switches and of no informational value to that machine.

Still, this fixed and stable state in our contemporary machines with their waste heat is by design. Ironically, many researchers – both within semiotics (Pietarinen, Beni 2021: 507; Rapaport 2012) and outside it (Piccinini, Bahar 2013) – believe

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[7] What is intended by Virtual in this paper is *not* the contemporary concept of virtual reality in digital mediums. Instead, derived from the late 14th century, its meaning is "'influencing by physical virtues or capabilities, effective with respect to inherent natural qualities,' from Medieval Latin *virtualis*, from Latin *virtus* 'excellence, potency, efficacy,'" (Harper, Douglas. Virtual – etymology, origin & meaning. *Online Etymology Dictionary*, www.etymonline.com.). It is notable, for the purposes of this project, that the meaning of 'virtual' has changed from '*inherent* natural qualities' and 'capabilities' to '*external* powers', as in the case of digital machines; digital virtual reality, for example, has no intrinsic "potency" or "efficacy" that is not afforded by either the external programmer of digital systems' inputs and algorithms or the external observers' interpretations of the outputs of such automated algorithms. Medieval treatments of Virtuality, on the other hand, can be found in *The Ordinatio of the Blessed John Duns Scotus*, vol. Book One, para. 120 of Second Distinction (Scotus 2021[1300], translated by Peter Simpson, was accessed at www.aristotelophile.com/Books/Translations/Scotus Ordinatio I dd.1-2.pdf). More contemporary treatments of this intended meaning of Virtuality can be found in Bergson 2010: 40, Simondon 2020: 81 and Bacigalupi 2025.

that this imageless machine can re-form itself in the same way semiosic systems do. But, without the irreducible nature of the image, there is absolutely no way for the machine to transcend its fixed hard- and software; how does the machine rewire itself without the *a priori* semiosic engineer?

Back in the early 2000s, a similar question was a principal inspiration for this entire project: how do neurons continuously rewire themselves to non-algorithmic and non-random adaptive outcomes? This is what humans, and other animals, do. The image helps answer this question without invoking an outside observer/engineer. The neurons, analogous to the musicians in our example, both mould and are simultaneously moulded by their shared interstitial medium. Because this shared continuous medium can be about the individual and collective; internal and external; past, present and future ensemble, simultaneously. Each node has its own sympathy to the shared milieu – transcending notions of "inside" and "outside", for example – and this unique sympathy to their shared continuum allows for each to both problematize and learn from the higher-order patterns of this medium, again, simultaneously. The so-called "agent", composed of such diverse sympathies, can re-*form* – or rewire, in the case of neurons – themselves based on the emergent, or Virtual, patterns of image; this is how semiosic systems in-*form* themselves, based on the emergent *forms* of image.

Contemporary machines, without image, cannot inform themselves. By design, it is not possible, no matter how many transistors of any type are strung together. Nevertheless, a novel type of machine is conceived below that can move in the direction of veritable semiosis. This is possible insofar as this novel machine instantiates a Virtual image, and this is only possible insofar as veritable irreducibility is built into the machine via a shared continuous medium. The dynamical behaviour of circuit nodes in this machine, like each musician in our symphony example above, both mould and are moulded by a shared continuous medium, *simultaneously*.

Unlike our musical example, however, the common medium in this nascent machine is not air, but electromagnetic (EM) waves in free space. Imagine that each node emits ripples of EM waves into their shared medium. Each of these emissions – in fact, arbitrarily many – superpose into a more complex pattern than each ripple alone. It is in the interference among the ripples that each of their behaviours can be realized as both individual and one unified pattern at once; like drops of water on a pond, the resulting interference pattern entails both the information about each individual drop and their shared spatio-temporal relations, *simultaneously*. In turn, these more complex interstitial patterns are the Virtual bases for the nodes to wire themselves together so as to become sensitive to similar collective spatio-temporal patterns in the presence of similar re-stimulation.

Both the behaviour of each node and their shared interference pattern in the continuum among them is the irreducible image. It is irreducible because the image embodies both distinct behaviours and their inter-relations. Each of these ostensible distinct aspects – the individual and the collective – co-constitute each other. To understand any one aspect necessitates understanding the others and the whole together.

We can imagine this novel machine as an array of Primary nodes (the dark nodes in Fig. 1). Each Primary node has its own sympathies implemented in this model by different resonant frequencies. On the left panel, some of these nodes are stimulated by perturbations from their environment. In response, they emit ripples into their shared milieu, generating an interference pattern: arbitrarily many patterns superposed with, i.e. transparent to, each other. This interference pattern embodies a lot more information than might be immediately obvious. For example, not only does this pattern physically manifest each distinct behaviour of these particularly tuned nodes, but it also captures the spatio-temporal relationship between these nodes' stimulation and emission. As the illustrated constructive interference of this interference rises above the surrounding noise floor (represented in the image by the flat white background), it can be harnessed by the system itself; the system has harnessed sparse order from the noise. This is represented in the right panel by lines, which indicate that these nodes have become connected, i.e. rewired, based on this emergent interference pattern. These self-made connections bias the future behaviour of the machine: in the future, it will not only be sensitive to signals that have stimulated individual nodes but also be sensitive to more complex patterns.

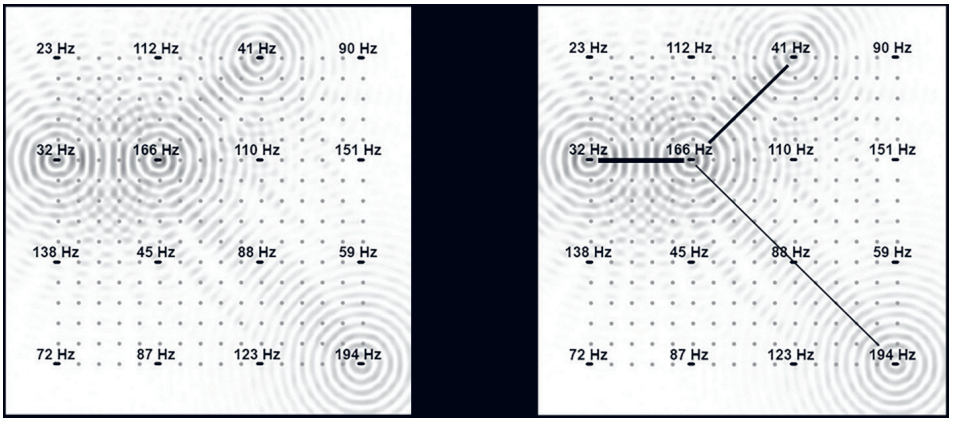

Figure 1. Array of diversely tuned sympathetic nodes.

This emergent interference pattern is the image and is a Virtual map for this machine to bias itself; in this way, it re-*forms* itself to in-*form* itself. How living systems can harness this sparse higher-order pattern to create more complex future behaviours remains an active area of research. As an initial step towards empirically justifying this research, this schematic design proposes the lighter grey and more numerous Secondary nodes in Fig. 1, which are able to discern the distinct regions of potential power in the image. The illustrated ripples in Fig. 1 represent the constructive interference that can generate differentially more power in the Secondary nodes compared with the surrounding noise, which is represented as the white region without ripples. A detail of this process is further illustrated in Fig. 2, where the blue Secondary nodes discern the more salient constructive interference pattern generated by the Primary nodes P1 and P2.

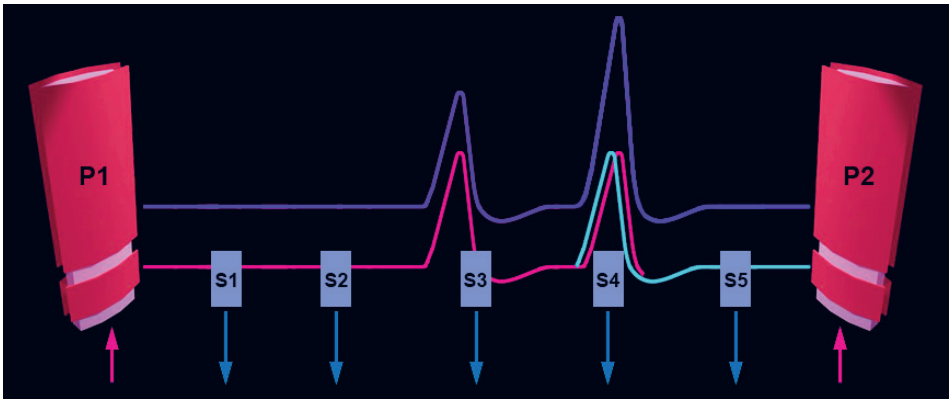

Figure 2. Primary and Secondary nodes with constructive interference.

As two Primary nodes are stimulated, having reached a threshold for emitting a signal, their respective emissions ripple through their shared continuous medium (the blue and red pulses in Fig. 2). The constructive interference is the superposition, or summation, of each individual pulse; this is the purple pulse illustrated in Fig. 2. Secondary nodes can indicate not only that some pulses exist, but that some are bigger than others. The Secondary node S4, for example, translates this ephemeral event into a digital record of when and where this heightened pulse occurred. This indicates that Primary nodes P1 and P2 are active and that P2 fired first. Information like this is continuously stored about the overall interference pattern. Fig. 3 illustrates this more complete machine.

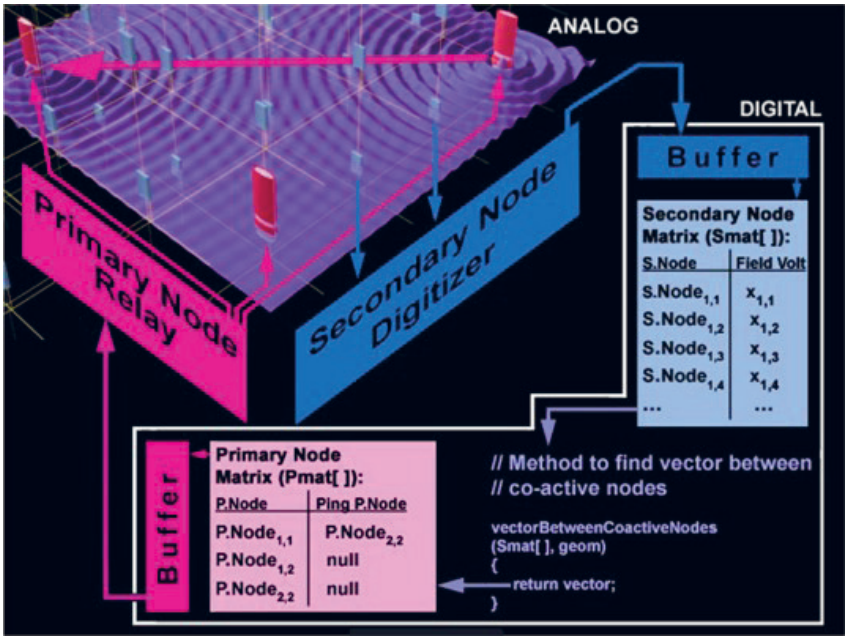

Figure 3. Analogue and digital hybrid implementation of image.

In general, the areas of greater constructive interference are recorded by Secondary nodes. In this current implementation, a digital algorithm then calculates which Primary nodes would have generated this pattern. This information is then used to create connections between Primary nodes that will bias their future behaviuor in the presence of similar environmental stimulations (this describes how the weighted lines in the right panel of Fig. 1 will have accrued with stimulation over time). And this process emulates how a semiosic system can harness the sparse order from the shared interference pattern among nodes. This process operates continuously and can generate arbitrarily complex circuit patterns as illustrated in Fig. 4.

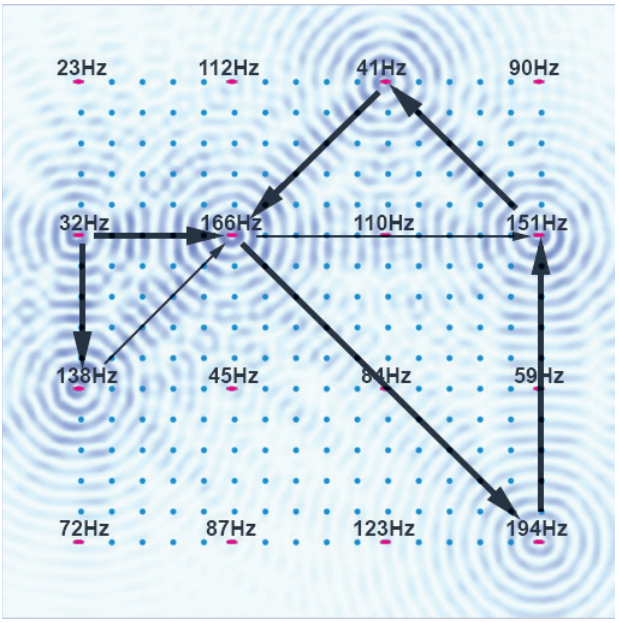

Figure 4. Arbitrarily complex self-wired circuit.

It is important to emphasize that no such machine exists to date. Contemporary artificial neural networks (ANNs) responsible for so-called "artificial intelligence" (AI) do update their networks. However, these updates are predicated completely on algorithms and pseudo-randomization alone (Aloysius, Geetha 2017; Elhassouny, Smarandache 2019; Katanforoosh, Kunin 2019[8]). The proposed novel machine, on the other hand, also evolves based on intrinsic sympathies and the infinite potential of the Virtual image. This novel process is not reducible to its numerical representation, as in legacy machines, because the evolving analogue circuits generate ever-novel images that are highly sensitive to initial and boundary conditions, which themselves are continuously evolving. This evolution of evolution entails a radical form of creativity that this project argues is a necessary precondition for veritable semiosis in living adaptive agents.

This novel machine does employ both algorithms and chance (approximated in extant machines via pseudo-random algorithms), but it does more than this. It also embodies *positive sympathies* (Peirce 1893: 189) and their shared continuum. These are the preconditions for image, loosely illustrated in Fig. 5, which enables this novel machine to transcend its initial form.

[8] Katanforoosh, Kian; Kunin, Daniel 2019. Initializing neural networks. *Deeplearning.Ai*. Accessed at: https://www.deeplearning.ai/ai-notes/initialization/.

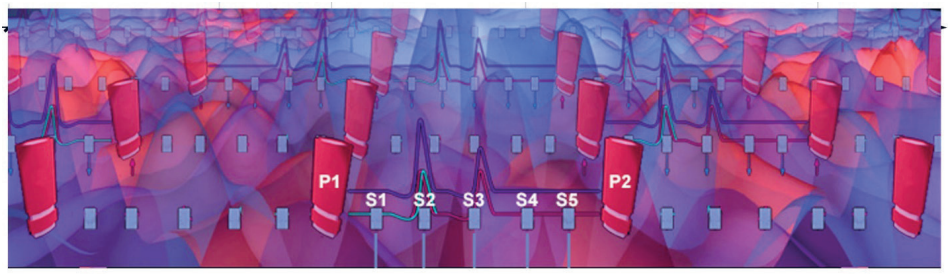

Figure 5. Primary and secondary nodes in their shared continuous medium.

Digging into the details of this schematic design one more level, the ongoing behaviour of each Primary node is simultaneously a result of its shared continuum and the "hard" circuit interconnections that have been accrued due to its exposure to patterns in its environment, as outlined above. The Primary node's sensitivity to its shared milieu is illustrated by the receiver at (g) in Fig. 6; its accrued connections to other Primary nodes are indicated by inputs x_i at (b) and outputs y_i at (j).

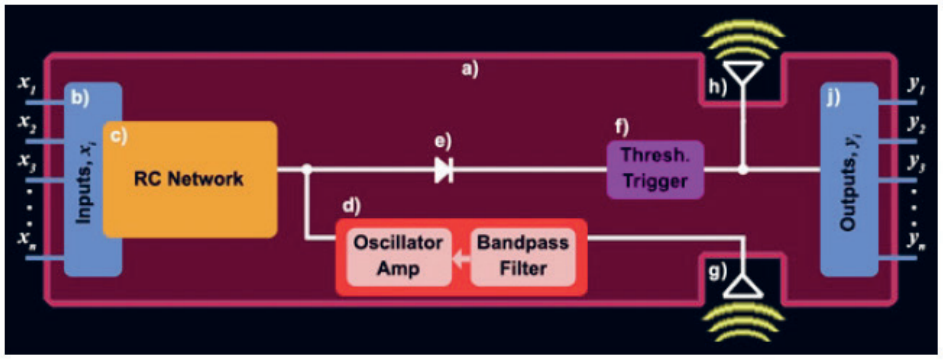

Figure 6. Schematic circuit design of a Primary node.

Simultaneously stimulated by inputs, x_i, and the portion of the interstitial noise filtered by its own sympathies – via the bandpass filter and amplifier at (d) – this particular node may reach its threshold for stimulation – via the diode at (e) and threshold trigger at (f). When this threshold is reached this node will fire, which means that it will do two things: emit a pulse back into its shared common medium via the transmitter at (h) and send output pulses, y_i, at (j) to formerly connected downstream nodes.

Semiosis as irreducible image

It is not necessary fully to understand the workings of the circuits described in the previous section to follow the central argument of this paper; the specifics of this design will certainly develop upon implementation. Nevertheless, the circuit schematics make a clear distinction between legacy Turing-equivalent machines, such as those used to implement AI via ANNs, and the proposed machine capable of image. The intent of the previous section is also to describe what image is to some degree of rigour and further illustrate that the irreducible attribute of image is central to understanding semiosis and *intentionality*, or "aboutness", in the philosophical sense.

For example, the circuits above, in their operation, exemplify this irreducible image as they continuously generate ever-novel patterns that are simultaneously about the overlapping sympathies of each diverse node and arbitrary patterns from the environment. In answer to the questions introduced at the end of the first section, this capacity to be about oneself and not oneself, simultaneously, is fundamental to semiosis. The system's behaviour is about itself insofar as it is constrained by the intrinsic sympathies of all the participating Primary nodes, and the system's behaviour is simultaneously *not* about itself insofar as it is about arbitrary patterns from the system's surroundings. Both of these distinct, and even paradoxical, aspects of the proposed system must be entailed irreducibly – i.e. distinctly, while simultaneously – to emulate[9] semiosis.

Although Lotman was principally interested in semiosis at the cultural scale, we will extend his insights of (un)translatability and (in)compatibility to address this paradox. As claimed in the first section: contiguity of being is only possible if *the living being constantly becomes other than itself to some non-trivial degree*. The novel circuit schematics above exhibit this adaptive (un)translatability, because they are always rewiring themselves based on ever-novel translations of their own operation, an operation that is, again, continuously affected and constrained by patterns in the environment and the behaviour of Primary nodes themselves. In this way, the initial and boundary conditions of all subsequent operations change, which irreversibly alters the subsequent evolution of the system (Bacigalupi

[9] As will be argued more extensively in the author's forthcoming dissertation, the proposed circuits in the penultimate section can *emulate* semiosis but not *duplicate* it. To date and in the near-term, only life itself can *duplicate* semiosis in novel beings. Existing Turing-equivalent machines can neither *emulate* nor *duplicate* semiosis; they can only *simulate* it. As such, this paper is part of a larger project that will build and empirically test a novel machine able to exhibit some aspects of veritable semiosis that extant machine architectures cannot, and never will, exhibit.

2024). The system can never perfectly translate itself. Much of the past and current dynamics is echoed in subsequent dynamics, *but not all*. Therefore, the system is *less* than itself as it develops. However, paradoxically, the system also translates *more* than itself at each iteration because of the ever-novel patterns that emerge from the continuous common medium, i.e. the emergent constructive interference in the noise.

On the contrary, the digital state machines of today are specifically designed to translate themselves perfectly; this is their strength and utility in our industrial age. But this control has a cost: *the machine can never transcend itself*. It can only copy and re-arrange its discrete states one-at-a-time in sequential causality. This lack of intrinsic transparency is degenerate semiosis, because it only exhibits brute one-to-one action and reaction; there is no veritable potentiality, Peircean Firstness or Virtuality. And, without this infinite potential, there is only mere simulation of Peircean *habit*, or Thirdness. The digital machine – and the vast majority of all extant human machines – have no intrinsic Virtuality, so they have no image, and they do not, in of themselves, exhibit veritable semiosis. They are but shadows of human semiosis.

In contrast, the novel machine above endeavours to create a system that does entail some semblance of an image via emulation. It may not be a veritable duplicate of living semiosis, but it will move in that direction. Indicators of success will be the capacity to embody a higher-order pattern that is simultaneously distinct from, while dependent upon, multiple lower-order patterns. Magenta, for example, is a higher-order sign, meaning it is categorically more complex than the two signs of red and blue that constitute it. Magenta does not obviate red and blue; magenta is both the dynamics of red and blue as well as novel dynamics, which is the result of an ever-more complex image. Another example that has been explored in depth in Bacigalupi 2013, 2023, 2024, is that of musical chords: notes co-occur to constitute the more complex dynamics of chords, while multiple chords co-occur to constitute more complex chords. These are all examples of irreducibility, because magenta and the more complex chords are not reducible to mere concatenations of simpler signs. These more complex signs have complex dynamics that are unique to their emergence via the harnessing of the sparse order in the image, as explained in the previous section.

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L'irriducibilità nella semiosi attraverso l'immagine

Questo articolo affronta la natura e l'importanza dell'irriducibilità nel processo di semiosi. Mostra come tale concetto sia centrale nell'approccio triadico alla semiosi di Peirce, nel cerchio funzionale di Uexküll e nella funzione creativa che Lotman attribuisce alla costruzione del significato. Questi modelli vengono poi reinterpretati alla luce di una prospettiva non strettamente semiotica – il concetto di immagine sviluppato da Bergson – che ne chiarisce ulteriormente il significato teorico. Partendo da questo quadro, la semiosi e l'immagine saranno reinterpretate attraverso una tecnologia innovativa, realizzabile e sperimentalmente verificabile, basata su circuiti immersi in un ambiente condiviso di rumore. Questo modello ancora la semiosi a un processo fisico concreto. L'analisi conduce infine alla concezione della semiosi come immagine irriducibile. Questo nuovo approccio alla semiosi può trasformare il modo in cui il processo di apprendimento viene compreso e insegnato.

Semioosi taandamatuse mõtestamine kujutise kaudu

Artikkel algab semioosi protsessis esineva taandamatuse olemuse ja tähtsuse selgitamisega. Täpsemalt näidatakse, kuidas see kontseptsioon on vajalik Peirce'i kolmeosalisele semioosikäsitlusele, Uexkülli „funktsiooniringile" ja Lotmani „tõlkimatusele". Seejärel selgitatakse neid mudeleid Bergsoni kujutisemõiste mittesemiootilise prisma kaudu. Kõiki neid omavahel seotud semioosi kontseptsioone, sealhulgas kujutist, analüüsitakse uudse, arendatava ja testitava tehnika abil. Selles lahenduses rajaneb semioos füüsilisele protsessile, mis toetub jagatud mürakeskkonda asetatud isepingestuvatele vooluringidele. Nende argumentide põhjal jõutakse artiklis järeldusele, et semioosi võib mõista kui taandamatut kujutist. See uudne lähenemine semioosile võib muuta seda, kuidas õppimisprotsessi mõistetakse ja õpetatakse.