THE UNMARKED AND THE MARKED: QUALIFYING EXISTENCE WITH IMPREDICATIVE HIERARCHIES

Anubhav Monga

ABSTRACT: This paper is about models (scientific, psychoanalytic, linguistic, theological or yet otherwise) and about how by ignoring the epistemological and metaphysical implications of the modelling process so ubiquitous in the scientific paradigm of today, we have not only hindered our understanding of phenomena from growing but completely misunderstood the nature of the most fundamental phenomena of being. Notably, the distinction between model and the modelled, or self and the Other is a primordial distinction any model-making edifice has to consider, lest the blowback of negative feedback disentangles the integrity of the model.

KEYWORDS: Models; Modelling relations; Laws of Form; Impredicativity; Self-referentiality.

MODELLING AS ABSTRACTION

To abstract means, etymologically, to pull away or drag away. In its modern sense, we understand it as taking away concrete context from a contingent phenomenon to reduce it to a non-contingent token of the actual instantiation of the phenomena. Such a token retains a selection of qualities or relational correspondences in accordance with criteria of abstraction, selected according to the pragmatic purposes of the model-making edifice.

Such an contextless abstraction produces models which can be interchanged with the respective contextually-embedded phenomena, where equivalence criteria is determined by the selected terms of abstraction and the purpose of the model (such as prediction or control). A model is sucessful if the selected terms of abstraction produce a model which serves the intended purposes of the modelling edifice, otherwise unsuccessful. Such a process, is meant to make the abstraction

an interchangeable edifice which can be applied or brought to particularities of novel contexts successfully, in a process we will call realization or application of the model.

By stripping away "irrelevances" of material contingencies i.e. abstracting away models, one cannot hope that the realized model and the real phenomena will behave in exactly the same ways, as predictive powers of the model only hold for the selected terms of abstraction. In other words, one cannot retain the semantic field which bears particular contexts within the structures of syntactical models, without expanding the model to complexity of the phenomena itself. Or yet again, one cannot ignore the existential qualifications of processes yet keep on theorizing about the output/produce without encountering discrepencies and side-effects. This paper, thus, argues that spatio-temporal field of existence i.e. semantic field cannot be located in or reduced to modelled formalisms without collapsing the distinction altogether, which is not possible in case of syntactical models.

In this regard, this paper is about two subjects: the nature of artificial models and the nature of natural existence, and what is irreconcilable between them. The idea that artifical models of natural processes or faculties are merely metaphors placed in their stead (for instance, computer memory instead of living memories) and hence unavoidably inadequate to describe or explain the original phenomena, is not a novel thesis. However what is profoundly novel is what we find when we consider the works of polymath George Spencer-Brown, mathematician Jean-Yves Girarde, physicist David Wolpert and theoretical biologist Robert Rosen in light of each other.

THE SYNTACTICAL AND THE SEMANTIC

Semantics is fundamental to all natural languages. When dimension of semantics is removed from a language, leaving only syntax, it is called a formal language. These formal languages are and have been for a long time beloved darlings of mathematicians and physicists as well as computer scientists because they provide an excess of rigor and context independence, which are valued in terms of objectivity. Objectivity means that a proposition's truth value can be determined without taking any consideration of the point of view of the one determining the said value (the subject), i.e. it is not subjective. When this point of view cannot be

excluded from the consideration, it presents vicious circles of self-referentiality which are very tricky to deal with within the syntactical universe of formal languages.

In such a scenario, one is forced to abandon the formal language and take cues from the meta-linguistic world to corroborate the proposition. Hence, the escape from vicious circles forces taking a meta-linguistic standpoint, which we call semantics. We will call this process *contextualization* since it depends on adding context to place the subject (model-making edifice) within the model. It should be noted that strict formalization (or *semantic destratification*), which exludes semantic field from conceptual universes, are often not the demands of problems themselves that need to be solved but by extraneous standards of rigor which are standard in these departments (Rosen, 1991).

We shall distinguish two kinds of models: the syntactical and the semantic. Former are indifferent to the system at hand and are predefined mechanisms which give an output for a given input whereas latter are grounded in their pragmatic function and are context-relation specific. This distinction is very fundamental but very rarely acknowledged. Within the field of theoretical biology (Rosen (1991), Kauffman et. al. (2012)) however, it has been pointed out how in syntactical models, it is not possible to distinguish side effects of a biological process from healthy functions because they are purely constructed in terms of informational organization of biological components rather than their functions.

It should be noted here that the "organization" in above statement does not refer to functional or relational aspects of organization (i.e. information with semantic components) but purely entropic aspect (i.e. information which can be syntactically measured), so a system which has more random (and hence disordered and useless) organization which cannot be syntactically reduced, it would have a higher Shannon entropy[1] and hence higher amount of "organization" but would have no functional value, since functional organization requires organizational redundancy in structures which gives lower Shannon entropy.

One key characteristic of syntactical models is reliance on sets of differential

1 Shannon entropy refers to the "informational value" which depends on the degree to which the content is disordered or surprising. For a highly likely event, the content carries very little information. However, for a highly unlikely event, the content is much more informative.

equations which can be applied given a particular kind of problem, disregarding the context. Such an approach is grounded on Newtonian model-making in physics where every state of a system can be explained by referring to previous system state and the consistent "laws" which the system obeys, applied on the initial state (or boundary conditions) recursively, regardless of considerations of *form* or *telos*. In this schema, the state of the system and its behavior is causally explaned in terms of Aristotelian material and efficient causes where former refers to constitution of the system and latter refers to the instantaneous actions of the system.

Aristotle described four types of causes: material, formal, efficient and final. While the ever prevalent Newtonian approach to model-making implicitly acknowledges material and efficient as its objects and their forces, respectively, it foregoes or forecloses consideration of formal and final causality, as they stand anti-thetical to the reductionist and determinist scientific ethos. Taking consideration of formal causes involves a holistic/relational perspective where the relations between components have causal properties independent of the components themselves and consideration of final causes involves consideration of pragmatic functional perspective where the purpose or *telos* of a system is taken into consideration.

While the former suggestion goes against strict reductionism, the latter goes against strict determinism of the scientific paradigm of the day, which we shall henceforth refer to as the reactive paradigm following Rosen (1985) as it takes explanation of system behavior to be explained entirely in a reactive or passive understanding of component subjects where no new information can be generated as all actions of system can be traced to its previous states all the way back to initial state.

THE UNMARKED AND THE MARKED

In order to discuss models, we need to discuss originary distinction which is primordial to all models, the distinction between the model and the modelled, or in parlance of this article, the unmarked (the model self) and the marked (the modelled other). Chapter 2 of George Spencer Brown's 1979 landmark text "*Laws of Form*" begins with proclamation "*Draw a distinction*". The moment of first distinction made in the *void* which gives us *forms* which can be *indicated* as either

unmarked or marked, is henceforth called the originary or the primordial moment or distinction. He notably announces that the theme of the book is of a universe which comes into being when severed or taken apart:

> The skin of a living organism cuts off an outside from an inside. So does the circumference of a circle in a plane. By tracing the way we represent such a severance, we can begin to reconstruct, with an accuracy and coverage that appear almost uncanny, the basic forms underlying linguistic, mathematical, physical, and biological science, and can begin to see how the familiar laws of our own experience follow inexorably from the original act of severance. The act is itself already remembered, even if unconsciously, as our first attempt to distinguish different things in a world where, in the first place, the boundaries can be drawn anywhere we please.

With such a declaration he has the grounded possibility of higher, more sophisticated elaborations or the expressions of the forms to exist. It is this originary distinction which we need to be able to think, to perceive, to feel, to be affected and to anticipate. All modalities of finite beings rest on being severed from the infinite while being contained within it, such that finite and the infinite correspond as mirrored forms.

Towards the end of the text, Spencer-Brown remarks that "a distinction drawn in any space is a mark distinguishing the space. Equally and conversely, any mark in a space draws a distinction" right after declaring that "an observer, since he distinguishes the space he occupies, is also a mark". The text ends with the statement "We see now that the first distinction, the mark, and the observer are not only interchangeable, but, in the form, identical." In following sections, we will invert this by arguing that the subject or the observer itself is the unmarked, as it is the excluded other which is marked for interactive sense-making while the self is obscured.

THE UNMARKED AND THE OTHER

In Lacanian psychoanalysis (Evans, 2006), the mirror stage is the moment of the originary distinction in the psyche of the infant where he sees and identifies, in the mirror, the spatial complex which corresponds to itself and identifies with it, marking a distinction between self and not-self. Without such a distinction of the self and *the Other*, the rational structure of thought and language collapses as foreclosure of Other becomes the pre-condition for a psychotic structure of the

psyche.

But what is an Other? To us, Other shall stand for the marked distinction from the self, whereas self is the unmarked and untraceable trace, which provides edifice or substrate for the self to emerge. Because the foundation or the ground for the self is always obscured because it cannot look at itself from outside, self-in-itself or *the self* is unattainable within the horizons of self-knowing, only deferred projections of the self can be acknowledged.

While the Other is a marked trace as the reflected self in the mirror which is acknowledged as the anchor for the self, the self remains ever-unmarked. This fundamental tension creates the internal dynamism of the selfhood which never crystallizes to a static conclusion (a resolution or dissolution) within a temporal existence.

By way of making models which can determine future of human society, humankind has taken a liking to playing external function, the Other to itself, previously attributed to divine entities. One may draw parallel to Baron Münchausen, who claimed to have pulled himself out of a swamp by his own hair, suggesting:

> ... he had somehow managed to split himself in two, so that the hand that grabbed hold of a part of his body belonged to an alter ego. A miraculous and impossible feat, of course—and yet all human societies have been able to accomplish the like of it. Indeed, this may well have been the condition of their becoming societies in the first place. (Dupuy, 2013)

Dumont (1980) understood such splitting or exteriorization of self as a form of *hierarchy* (etymologically "sacred rule" from Greek). However, what sort of hierarchy did he mean? Hierarchy here stands for a complex relationship between contraries, it is not the mere domination or privileging of a level above another, but a bidirectional entanglement ("*tangled hierarchy*" as referred by Hofstader, 1979). What we see in the Other and the self is such an entanglement, as one cannot be emancipated from the other without collapsing the distinction entirely. This externalization of self in the Other is what model-making, at large, refers to. As in, models are externalized selves which we use to pull ourselves "by the bootstraps", and it is in this sense, that our minds are model-making edifices.

LANGUAGING: THE EMERGENCE OF SEMANTICS AND SYNTACTICAL STRUCTURES

Language, while not being a model of anything but its own deployment and use, demonstrates a dizzying level of contextual complexity which escapes any possibility of purely syntactical formalization in a prestatable form. Since the pragmatic dimension of language is so crucial in linguistic studies, it is evident that, there can be no complete model of language sans the meta-linguistic dimension of semantics.

Scaffoldings in form of syntactic structures are considered useful insofar as they serve to build pragmatic and coherent descriptions of a corresponding semantic field i.e. they *mean* something. But emergence of this sense-making or semanticization is not a trivial problem. According to Negarestani (2018) semanticization is a consequence of a pragmatic interactive paradigm of intersubjective *games* which contextualize the sense-maker within the biosphere. In this pursuit, Negarestani (2018) deploys Girardian *ludics* as "*an inferential theory of meaning, dialogical and operational semantics, an autonomy of minimal syntax, and a general notion of game devoid of any predetermined winning strategies or payoff functions*".

For ludics, we are interested in the intersubjective dialogue with the other as a dynamic interactive "game" in which rules (syntax) and intentions (semantics) spontaneously emerge throughout the course of the game or the dialogue. For a given dialogue, the conversation progresses via role switching between interpretation and response functions for speech acts of assertion and questioning. These players, in an imaginary dialogue exchange *utterances* as speech acts in a pragmatic context upon which themes of further utterances can develop and grow into syntactic and semantic ideas in relation to each other i.e. syntax derives *eigenfunctions* from semantics and semantics derives *eigenvalues* from syntax.[2] A very similar approach was already hinted at, by Brier (1996), in what he termed as "languaging".

If instead of recursive non-ergodic processes, we were relying on an ergodic osmosis of information, any such structure of meaning embedded in syntax-

2 The concept of eigenvalue/eigenfunction comes from recursive function theory (von Foerster, 1976) where an eigenvalue is a "token for stable behavior" in a dynamic system which gives eigenfunctions or functions of stable behavoir. Here, a syntax is a stable function for a given grammar and semantics are stable tokens for given behavior.

semantic correspondances would have taken many orders of lifetimes of the universe to crystallize. Therefore, in practical terms, only such non-ergodic processes can yeild ontological expansion of a sufficiently complex system. It is the autopoietic survivalist nature of "the game" which prefigures *contextualization* and *topicalization* in a dialogue which selects for survival. This corresponds to Niklas Luhmann's theory of social-communicative systems where, as Brier (1996) notes "c*ommunication does not transmit meaning but rather requires it as given and as forming a shared background against which informative surprises may be articulated*". It should be noted that the opponent in the dialogue can be the biosphere itself.

The test is the interaction between speech acts and context. The impact of the speech act on the interaction is in terms of the updating, modification, or erasing of a shared context (Negarestani, 2018, p. 372). In ludics, different interacting strategies are tested not against a preestablished model, but against one another. In the process, the rules of logic emerge from the confrontation of strategies which interact as players in a game rather than propositions. "*Ludics shows that the continuity between syntax and semantics is naturally achieved through an interactive stance toward syntax in its most atomic and naked appearance: the trace of the sign's occurrence, the locus or place of its inscription*" (Negarestani, 2018, p. 366).

Reader should note here that such a model of interaction does not bear a static ontology based on pre-stated syntax as it operates by making the distinction between inverting poles of self and the Other, where the other can be the environment itself which dynamically and actively interacts with the system and determines its system ontology qua syntax. "*It is only in the presence of an environment (another system, machine, or agent) that computation can be understood as an increase (or decrease)—rather than mere preservation—of information"* (Negarestani, 2018, p. 345).

COMPLEX HIERARCHIES AND INTERNAL TENSIONS

Just as we considered mirror stage as an originary distinction in Lacanian psychoanalysis, in this section, we will take inspiration from continental philosophy and Christian theology, in order to demonstrate ubiquity of these considerations in relation to modelling across disciplines and approaches. In a functional sense, these considerations refer to matters which are pre-scientific, pre-philosophical and even, one might suggest, pre-linguistic. They are pre-requisite for any coherent thought.

It should be noted now, that there are special kind of models which do not adhere to classical logical schema of true and false; one or the other; the law of excluded middle. These models seem contradictory and non-sensical until they are properly charted. Such models involve a complex hierarchies which cannot be represented as Venn diagrams or simple linear flowchart or set notation because they feedback on themselves in cybernetic loops of second order.

The splitting of the Other and the self is the primordial moment of knowing which is self-referential, in so far as the self is referred to Other-side which is referred back to self. We find a similar tension in Hegelian master-slave dialectic (Hegel, 1977), where the tension can neither be dissolved (the distinction is unsurmountable) nor resolved (the recognition is impossible). When two conscious beings encounter and seek the recognition of their consciousness, they cannot help produce a paradoxical dilemma. It is akin to one seeking a reflection with a conscious mirror which itself seeks its own reflection in one. The resolution of this mutual tension concludes with subjugation of the one by the other into a hierarchy, only one can see the reflection at a time.

However, neither slave nor master is "superior" in the naive sense of "higher" in a simple or stable hierarchy, as either wields power over the other. It is slave who masters the material processes which constitute reproduction of the master as an actual occurrence[3], and while master gives the slave his identity, the slave gives master his status as one. The power flows in both directions at different rates and thresholds, but it adds up to equal amounts. Master and slave, thus, constitute a complex hierarchy which is metastable and maintained by the bidirectional flow of constitutive and legitimization power.

Similarly, it has been argued that "in matters of religion, and hence absolutely, the priest is superior to the king or emperor to whom public order is entrusted. But ipso facto the priest will obey the king in matters of public order, that is, in subordinate matters" (Dumont, 1986). The hierarchical tensions are therefore complex in the sense that they are neither vertical (direct precedence of one above another) nor horizontal (no preferable precedence) but rather diagonal in so far as the precedence is specific to mode of analysis and/or moment in time.

3 Which as a form of power whose individuating potential is overlooked in the history of western thought (Simondon, 2020).

Such diagonal hierarchies can be understood in terms of the primordial distinction. The unmarked is the unity or the totality, by virtue of which, it encompasses the marked; whereas at another level (that of the complementary subsets), it is opposed to the marked. "*The whole, in other words, encompasses its contrary—the part that does not coincide with the whole*" (Dupuy, 2013). Irigaray uses a similar understanding of distinction to describe the tension between the sexes, where the feminine is the unmarked and obscured ("the sex which is not one") while the masculine, as the marked, is taken to be all encompassing threshold for the sexuality.[4]

> 'She' is indefinitely other in herself. This is doubtless why she is said to be whimsical, incomprehensible, agitated, capricious…not to mention her language, in which "she" sets off in all directions leaving "him" unable to discern the coherence of any meaning. Hers are contradictory words, somewhat mad from the standpoint of reason, inaudible for whoever listens to them with ready-made grids, with a fully elaborated code in hand (Irigaray, 1985).

Another example includes the distinction of the Good and evil in Christian theology. Thomas Aquinas (1947) defines evil as the absence or privation of Good. This is a Boethian position on evil where evil is not a thing in itself but merely absence of Good itself, an inhibition of God's divine light, a shadow. And just as shadows are *contained* as in delimited at their thresholds by light, evil is contained by Good as its own contrary *contained* within its own bounds. God is not merely good as a secondary property, rather God's essence is of Goodness; or yet again, God is Good-in-itself (Hart, 2019) and hence encompasses all the evil within him. "*[G]ood must contain evil while still being its contrary*" (Dumont, 1986).

Above example employs a dual understanding of 'contain', both as enclosing an entity as well as blocking, inhibiting or repressing it. Such a hierarchy is not a simple or stable duality, rather it is an unstable and complex figure of nested power relations, going all the way down infinitesimally. *"Evil is, at bottom, only a lesser evil, a necessary evil, for it is placed in the service of the good; evil is only apparent, for it is an integral part of the good"* (Dupuy, 2013).

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4 Interesting implications here with respect to "otherization of the feminine". If unmarked is by definition the self, this argument presents the feminine as the obscured self where as the masculine is the aspirational Other.

SELF-REFERENTIALITY AND CONSTRUCTIVE TEMPORALITY

Paradoxes of self-referentiality are famous for being unresolvable in classical systems of logical formalisms. For instance, in formal mathematics, Russell's paradox, analogous to liar's paradox in general parlance, where a man claims to be lying, so is he lying or not? Such self-referential loops in logic produces a state of *impredicativity* where it is not possible to ascribe a conclusive predicate to the output state of an executed logical process because the process keeps looping back indefinitely. However, what is often overlooked is that these formalisms are *destratified systems* with no room for constructive hierarchies, as in where each operational output being an state output of an n^{th} iteration (n being a natural number) of a procedural process, switching between respective states depending on the day number (phase of recursive loop).

Heinz von Foertster (1970) points out that the so called scientific method excludes formal definitions which include self-referentiality or closed logical systems that include "*the referee in the reference, the descriptor in the description, and the axioms in the explanation*" as they are considered logically incoherent or paradoxical inherently. "*In order to refute this theorem it is tempting to invoke Gödel's Proof of the limits of the Entscheidungsproblem in systems that attempt to speak of themselves. But Lars Löfgren* [1968] *and Gotthard Günther* [1967] *have shown that self-explanation and self-reference are concepts that are untouched by Gödel's arguments.*"

The need to re-stratify the formal systems into a constructive temporal dimension, however, is the approach taken by Spencer-Brown in *Laws of Form* to resolve a similar state of impredicativity with his "equations of second degree" (self-referential expressions), however it is inadequate. I propose that paradoxes of impredicativity or self-referentiality in any formal (purely syntactical) system are consequences of the semantic destratification i.e. processes which do not refer to a spatio-temporal existential context for grounding. Such a grounding is henceforth called, an *existential qualification.*

But before that explication, we shall understand the gravity of Spencer-Brown's contribution as understood by cyberneticians such as Heinz von Foerster and Niklas Luhmann (Alphabetum III). Spencer-Brown introduces a simple operation of "crossing" which serves as a "token for drawing a distinction" (identifying points inside and outside its severed domain). He showed that when an expression using this operator is allowed to refer to its own components as itself, we have an impredicative situation which cannot be resolved in a system

without a time-axis. When temporal hierarchy of recursive process is introduced, the expression takes on both values of unmarked and the marked at alternating values of *n* (number of iterative cycles). It flips between 0 and 1 indefinitely.

> Of course, as a cyberneticist, von Foerster was already primed to recognize the virtues of feedback loops, and here was a notational system that seemed to oscillate, in logical circles, between indication and distinction — back and forth, tick and tock. The 'shiniest' of the book's 'many gems', he exulted, was that Spencer Brown had established that this 'flippity' movement in the primary notation required the invention of 'time' as a category for further inquiry (Alphabetum III).

Taking further from here, it can be argued that the functional encoding of the Russell's paradox makes the dilemma much clearer than the logic or set theory expositions. A recursion on an arbitrary function (represented as R(R)) is usually allowable in most formal systems, however, due to the implications of circular causality, it is never the same R twice. The real formula must be some form of R(R') instead which is why we lose all *constructive difference* when the formula ceases to be stratified in discrete *n*-time. The same is true for the loss of history or diachronic causality, which destratifies all events to an ergodic mush of a block universe with no temporal reference frames.

Russell's paradox is the mathematical expression of this fact, that if R(R) = true exactly if R(R) is false and vice versa, induces contradiction in a trivial sense. Triviality is the case in which we make no distinction between logic values. So at that point, we really say nothing: the set of all elements X such that X is not in said set. The function which gives the first projection if and only if it gives the second projection, meaning there is only one projection.

The paradox can be formulated in any formal system with rich enough syntax because it is enabled when one permits unstratified expressions, the representative power of the formal system collapses to trivial. It is a direct expression of a type of narrative catastrophe as negation gains a fixed point, no formulas can ever build up meaningfully and we lose the ability to derive new propositions from older ones as we are trapped on $t=0$.

Such expressions are an example of the way reference to field of existence or semantic meaning is lost. Negarestani (2018) discusses how it is not the same I when I refers to itself, instead there is a fracturing of I into referee I and reference I instead or the mapping from I to I*. With reference of information theory, Kampis (1991) formalizes a similar idea in terms of "information sets" which are

temporally stratified where the information elements are predicated on temporal parameter, in such a way that information relevent to future states is not a trivial inference. This is due to impredicativity in the systems, as impredicativity generates the measurement problem for the system.

Here what we have is a form of process metaphysics where ontology is not static, but rather a becoming; or in words of Heraclitus, πάντα ῥει῀. We must not actually be referring to ourselves but who we wish we were or used to be in an recursive process. The car crashed into the tree and the boy climbed the tree before it crashed. It's two different trees. Our models need to be designed with this processuality in mind otherwise they will always be too destratified to make necessary distinctions along temporal axis and fall out of phase with existentially qualified reality.

HOLONIC COMPLEXITY IN MODELLING RELATIONS

Arthur Koestler (1967, 1978) coined the term *holon* as a unit of analysis (for nature as a system), that is "*simultaneously part and whole*". We shall use it to analyze the integrated causality in what we will refer to as impredicative complexity. Kineman (2011) uses the term *holon* in terms of actual (realized) and contextual (potential) *aspects of nature.*

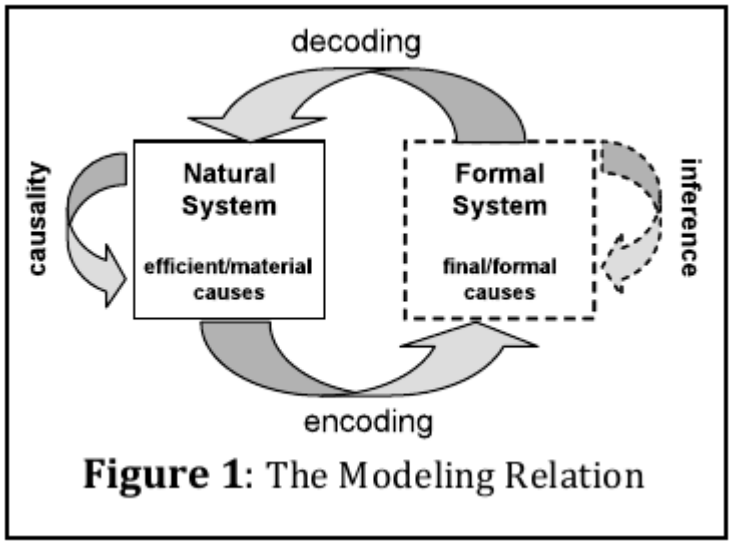

Figure 1 (Source: Kineman, 2011).

Figure 1 shows a modeling relation as depicted by Kineman (2011), which he borrows from Rosen (1991). In this modeling relation, we see the holonic unit as the relation between the natural systems (an encompassing class of all possible systems in nature) as the realized actual aspect whereas formal system represents the contextual aspect of natural systems. Context, as per Kineman's usage, is the non-local aspect of a system that enables or conditions the behaviour or properties of another system, which includes the existence of that system. Due to such a closure principle, if we consider a given system as the foreground and the rest of the system as the non-local contextual background, they form a closed loop of integrated causality.

> Non-locality refers to contextual potentials: unrealized constraints in a contextual system that establish the potential existence (formal cause) of another system. It is very much like an ecological niche factor space in which a system can be identified, aside from its actual occurrences, by its ability to exist in various factors that are realized independently. The niche-space thus identifies potential existence in factors other than time and location (which are properties of realization) (Kineman, 2011).

As the realized and contextual domains are interpreted as *ontological* aspects of natural systems, they cannot be considered as containing *pre-defined elements* because relational theory assumes that the only knowable elements are those *"abstracted from otherwise un-described realities"*. Kineman (2011) further declares that "*the knowable elements of a given domain that correspond to a natural system are the abstractions: structure and function. In other words, the results of a mapping are epistemological, but the domain of a mapping must be considered ontological."*

The compositions of mappings or morphisms between realized states are therefore recursive holon sequences. This means that the states are mutually determined and ordered by the causal feedback loops of system and context. This is the foundation of what we shall call *holonic complexity* (figure 2, Kineman, 2011). As such holonic entities are entirely interactional in their nature, they cannot be said to have identity function or even an origin in a trivial sense.

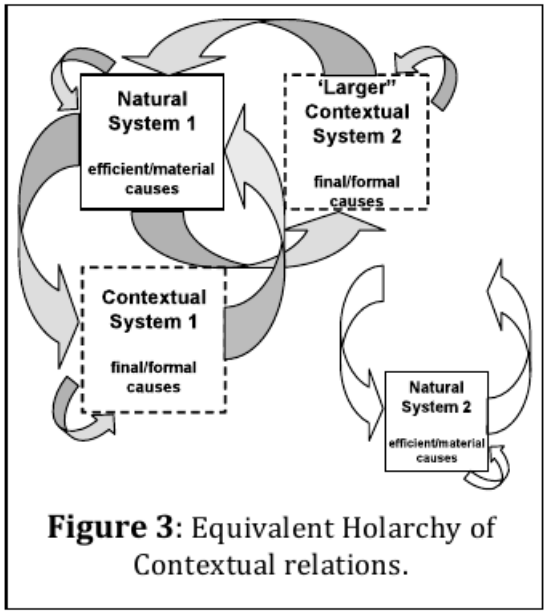

Figure 2 (Source: Kineman, 2011).

Kauffman et. al. (2012) point out that typically when physical processes are considered in physics, we can prestate the configuration space or phase space of the process. However, for general systems in the biosphere, the phase space itself is ever evolving due its holonic complexity, specifically in ways which cannot be prestated. Therefore, we have no settled invariant relations by which we can write down the equations of system evolution of the ever new relevant observables and parameters revealed after the fact. More specifically, "*we cannot prestate the adaptive "niche" as a boundary condition*".

But it should be problematized, why are natural systems in the biosphere unprestatable as Kauffman et. al. (2012) argue? It can be attributed to the self-referentiality/impredicativity of the holonic system that it refers to itself for the grounding context, which makes isolating the "input" and the "output" of the model tricky as they bleed into each other recursively.

WOLPERT'S MONOTHEISM THEOREM

Wolpert (2007) presents a set of proofs as a demonstration of cybernetic nature of measurement and inference itself where it looks at "physical limits to inference" in different kinds of cases til he exhausts combinatorial possibilities of

arrangement of measurement devices. One case he studies is of any two 'inference devices' which are essentially any reciprocally sensitive-sensible pair which hold prehensive affordance for each other i.e. exist on same order or domain where they impart and process their respective affect datum towards one another in a way that one can be used to infer about the other.

Wolpert proposes that for any two inference devices A and B, for each interaction or 'inference' they make, where A infers B or vice versa, there is always, by mathematical necessity (as he proves), a cybernetic condition imposed such that, either A or B will have more 'autonomy' in so far that possible states of being which can be measured or inferred by the counterpart device. Either A or B having more autonomy simply means that one of them, by necessity of physical limits of inference, imposes constraints of measurability or inference on the other, such that what state or behavior other corresponding device or object can suppose will be limited by the process of inference itself.

The scope of the paper is wider than presented here as it more generally addresses any device making inference about any function, not just necessarily another device of same order.*"Setting up a device to observe a variable outside of that device restricts the set of possible universes; only those [world lines] are allowed that are consistent with the observation device being set up that way to make the desired observation."* But coming to the two device scenario, it can go either way, either the inferring device will impose limits on the possible states inferred device can be inferred in or inferred device will constrain how inferring device can be probed for the inference. But both of them cannot have equal amount of operational autonomy.

Taking example of a device which probes the direction of an electron's spin, the way the measurement device is probed constrains which direction the spin can possibly be detected in. In the two device formulation, measurement of an electron spin constrains which states its paired electron can be found in. Thus, it can be said we have never detected a free electron, merely a constrained one. This is what entanglement in general refers to, quantum entanglement is merely a special case of such a general notion of entanglement where two inference devices are demonstrably and deterministically entangled.

This leads to various kinds of indeterminancies and uncertainties far more general than one may observe in quantum systems, which extend to cybernetic control loops of all kinds. "*It shows that independent of concerns of free will, no two devices can unerringly emulate each other. (In other words, no reality can have more than one universal*

device.) Somewhat tongue in cheek, taken together, these results could be called a "monotheism theorem"."

ROSEN'S PROOF OF UNSIMULABILITY OF IMPREDICATIVE SYSTEMS

In this section, we will not go into the details of Rosen's main proof from *Life Itself,* however we shall discuss the theorems and propositions presented for the benefit of our thesis. Rosen (1991) remarkably demonstrated using mathematical apparatus of topology and category theory and with some key definitions of *mechanism, simulability, computability* etc. that "*a living system must have noncomputable models*".

We should note here that Rosen divides all natural systems into mechanisms and non-mechanisms where the distinction lies in their *simulability* or, in other words, ability to be reduced to "a largest model". If a system can be reduced to a largest model, that means all possible models of that system can subside within one total model which encompasses them.

A more intuitive way of presenting this idea that Rosen chooses is to argue that when different models of same system show "additivity" in that they can be taken together or placed upon one another (similar to principle of superposition in classical mechanics) to have a larger model which can explain more properties or qualities of a phenomena or a system, we can consider all such models of a system to add upto a "largest model". For example. How models of arithmetic logical unit, memory unit and control unit in a CPU can be taken together to form a complete model of the CPU.

In such cases, we can say a system has models which are fractionable (in that their sub-models can be taken in isolation) and that they are mechanistic (their behavior can be described using models in isolation of spatio-temporal context). Rosen proves that not all systems are mechanistic or fractionable. He defines such systems to be *complex systems,* as opposed to simple mechanisms. This is very fundamental to our discussion, especially considering that key ingredient of such non-mechanistic and non-fractionable systems is their impredicative nature, where distangling them from their spatio-temporal context becomes impossible. Rosen states that "*if a closed path of efficient causation* [impredicativity] *exists in a natural system N, then N cannot be a mechanism*". Rosen crucially argues living organisms to be such systems.

SO, WHAT AM I TRYING TO SAY?

The core argument of this paper can be stated as follows: "any form of model-making interaction, be it observation, prediction, simulation, controlling, etc. involves a model-modelled distinction which rests on unstable epistemological ground due to the impredicative or complex hierarchical relations involved in such a split." This is a form of primordial measurement problem, which far transcends the bounds of physics. In this paper, we saw ideas and examples drawn from very disparate fields which all indicate towards a common underlying theme of a split and hierarchy between the self and the Other, which should be fundamental to epistemological and metaphysical considerations of any systematic study, scientific or not.

What explains the choice of the article subtitle *"qualifying existence with impredicative hierarchies"* is that this article presents theoretical themes of how it is the very nature of self-referentiality of "total" systems which are exhaustive, in the sense, that they encompass both their "self" part and "Other" part, which gives them a coherent shape as the self refers to the Other within that exhaustive totality. The marking of distinction is just as important as it is important to consider the totality as a whole, as without the former all linguistic coherence based on indication dissolves and without latter behavior of the self system considered in itself becomes contingent to forces outside the considerations of the partial model, making it useless.

anubhav605@gmail.com

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