The Phenomenal Becomming as the Deep Information's Interpretation*

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Abstract

The present approach is done in the **world of complexity**, a one-dimensioned space. The complexity is the single parameter of this world in which evolution means the *phenomenal becoming* followed by *structural settlement*. The evolution is a process that goes from chaos toward order expressed in phenomena and structures. The only process in chaos is the *fluctuation* generating kernels of order. In the mixture of chaos and of order the main mechanism is the **interpretation** generating *phenomena*. The order interprets, the phenomenon acts and the chaos fluctuates. The meaning of phenomena that act by interpretation is the **phenomenological information**. The phenomenal becoming does not stop avoiding the danger of the structural preeminence.

... [Epicur] starts to learn philosophy by despising his teachers unable to explain him the meaning of Hesiod's "chaos".

Diogenes Laertios

1 The World of Complexity

The philosophy of the deep reality [Drăgănescu '79] triggered this approach in which we want to offer a possible model only for the *phenomenal becoming* as a process in which the single parameter is **complexity**. Our approach is an imagined play between *forms* and *non-forms* on the **complexity axis** in the **world of complexity**. The specific content of the reality investigated does not matter. Only the balance between *simple* and *complex* is studied, supposing that the "initial state" of the investigated domain has a pure **chaotic** behavior - the **fluctuation** - in which the order is a promise, the meaning is an event and the expressivity a miracle. We stress on the idea that the pure chaotic behavior can not be an actual initial state. We have not any idea about an actual initial state. Maybe in the "initial state" time does not work and we can not say anything about the state.

*Communication held at the Symposium on the Structural - Phenomenological Modeling, organised by the Romanian Academy, 17 - 18 June, 1998.

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The *fluctuation*, as the primary form of pure generation, is the main process into the chaos. In the history of thought there are many suggestions leading to the idea of fluctuation as a fundamental process. For example, we can remind the Epicurian "clinamen" [Diogenes Laertios] and the Leibnizian "perfect spontaneity" [Leibniz p. 331]. Also, the contemporary quantum physics works with concepts such as "strings" or "branes".

Randomly, by fluctuation, the occurrence of the order starts the process leading toward phenomena or structures. The main concept promoted in this paper is the *interpretation*, responsible for the interactions between phenomena and structures. In these interactions new phenomena or structures can appear. Also, the *phenomenological information* is defined as the *interpretative action* mediated by the *structural order*.

2 The Computational Suggestion

In this section we want to emphasize that the suggestion for the main mechanism emphasized in this paper - the *interpretation* - comes from the process of computation performed on digital machines. A simplified computational structure contains:

- *Recursive Defined Simple Circuits (RDSC)* represented by combinational or storage circuits having a reduced algorithmic complexity because of their recursive definitions
- *RAM*[1] as a storage support used to memorize the dynamic data structure to be processed
- *ROM (PLA)*[2] containing the random symbolic structure of a control sequence for defining the function of the whole system.

The two RDSC subsystems represent the most ordered part of the system. The RAM subsystems has a simple, ordered, structure but its symbolic *content* can have any degree of order, from the rigorous order to random, passing through phenomenal expressed configurations. The ROM (PLA) subsystem has a two level structure:

- a basic uniform, i.e. simple, structure consisting in a *decoder* (or a "programmable" decoder for PLA) serially connected with a "programmable" *encoder*
- a secondary level having a random content obtained by "programming" the coder (and the decoder for PLA) with a certain binary configuration.

Shortly: *the ordered structure of RDSCs interprets the content of ROM (PLA) thus acting on the content of RAM.* The initial content of RAM is modified according to the (micro)program (control sequence) stored in ROM (PLA) through the action performed by the recursive defined simple circuits (for example: registers, ALUs, counters, shifters, ...) that *interpret* the content of ROM by *execution*.

More generally, an interpretative machine is recursively defined, suggesting that the interpretative mechanism acts on many levels into a computational machine [Wedig '89].

Definition 1 *An* **interpretative machine** *consists in:*

- *a language*

[1] Random Access Memory

[2] Read Only Memory (Programmable Logic Array - a simplified equivalent form of ROM)

- *a storage support containing programs written in that language*
- *an* **interpretative machine**

and the deepest machine is an **executing machine**. ◇

The recursive process stops with a physical implemented interpretative machine, the *Physical Execution machine*, that execute (the execution is the simplest interpretation, performed by circuits at the basic level) the content of the storage expressed in a certain language.

This model supplementary suggests that the random content to be interpreted (the content of *Storage*) is defined using the formal *Language*. Even if the content of *Storage* is conceived using a formal language, results a structure which can have a phenomenological or a random content with a very expressive, uncompressible, binary representation. This binary structure is processed by the interpretative mechanism.

Another suggestion offered by this model is the internal **loop** associated with each interpretative level. A hierarchy of loops define any interpretative machine.

We consider that the interpretative mechanism emphasized in computation is a perfect suggestion for the processes developed in the *world of complexity.*

3 Types of Complexity

Some preliminary definitions regarding the complexity must be given in order to ground our approach in the *world of complexity.* The next definitions refer to an one-dimensioned space in which the investigated processes take place. The only dimension considered in our approach is the **complexity**. There are many types of complexities in this *world of complexity.* We are interested here only in three of them: the *crude complexity*, the *algorithmic complexity* [Chaitin '77] and the *semantic complexity* [Ştefan '98]. The complexity has still an unstable meaning. The next definitions are only the working definitions for this preliminary approach.

Definition 2 *The* **crude complexity** *is represented by the size.* ◇

In many theoretical domains, such as circuits or computing, the dimension of the space or of the time is considered as being the complexity. For example, the complexity of a computation is evaluated in term of time and of structural resources (memory) needed to perform it. The *crude complexity* does not say anything about the *content* of the evaluated process.

3.1 Algorithmic / Apparent Complexity

Definition 3 *The* **algorithmic complexity**, $C_A(x)$, *of a binary representation,* x, *associated with an entity, refers to the size of the* **smallest** *definition of* x. ◇

Because the way towards the *smallest* definitions is difficult we are obliged sometimes to work, more or less consciously, with the *apparent complexity.* In almost all the cases, the apparent complexity is much larger than the algorithmic complexity, hiding a deep order. In the same time we have an un-legitimate hope to find order in places where facts are un-doubtful complex.

Definition 4 *The* **apparent complexity**, $C_A^*(x)$, *of the binary representation* x *refers to the size of the definition for* x. ◇

There are many realities for which we have not the possibility to discover the smallest definition. Various reasons keep us far away from the smallest definition, even if it exists. The hidden order is a feature of many processes generated or observed and the way toward the shortest description is many times difficult and roundabout.

Example 1 *Let be the graphic representation of a fractal. A receiver who does not know the generation rule is faced with a high* apparent complexity. *In fact, the actual algorithmic complexity of the fractal is very small, because the generation rule is written with a small number of symbols and can be translated in a very short program.* $\diamond$

Example 2 *If there is a cellular automaton simulated by a program on a computing machine, its behavior has a high* apparent complexity *for whom does not know the local rule of each cell. More, if the initial state of the cellular automaton must be taken into account, then the* apparent complexity *of the process increases. Only an actual complex understanding process, related to the cellular automaton, is the way to define it.* $\diamond$

The two previous examples represent systems in which, having the behavior, there are not simple ways to find the (simple) rules governing them. In many cases the real processes can be interpreted, in a good Cartesian tradition, as systems having a simple hidden rule responsible for their apparent complex behavior.

3.2 Semantic Complexity

The definition for algorithmic complexity does not work well for high values. At limit, following the algorithmic complexity the random processes are the most complex processes. But in a random process we don't find any **meaning**. Starting from this lack, the *semantic complexity* was introduced.

Definition 5 *The* **semantic complexity**, $C_S(x)$, *of a binary representation x is the unsigned difference between the algorithmic complexity $C_A(x)$ and max $C_A(y)$, where y is a binary representation that can be "subtracted" from the binary representation x without loosing any meaning of x. The "subtraction" is performed by XORing the two binary strings. More formal:*

$$C_S(x) = |C_A(x) - C_A(y)|$$

with

$$S(x \oplus y) \simeq S(x)$$

where: $S(z)$ is the signification set associated to the binary representation of z. $\diamond$

Theorem 1 *If the x representation has n bits and by XORing with y, s bits can be changed without any loss in meaning, then, an equivalence class with $q > (n/s)^s$ elements is defined having the string x as the* significant representation [Ştefan '94]. $\diamond$

Proof In order to modify s bits in the string x of n bits, a n bit string y is used having s 1's and $n - s$ 0's. $N = n!/s!(n-s)! < (n/s)^s$ is the number of distinct strings y. The number of n bits strings obtained modifying maximum s bits is approximated with

$$q = 1 + (n/1)^1 + (n/2)^2 + \ldots + (n/s)^s.$$

Because $n/s >> 1$ in the situations in which modifying s bits the meaning is not affected, the value of q is lower bounded by $(n/s)^s$. $\diamond$

The *significant representation* is usually associated to a huge equivalent class of facts having the same *semantic complexity*. The *semantic complexity* allows to expand the utility of the *algorithmic complexity* over the entire domain of representations.

4 Chaos - Fluctuation - Order

The *world of complexity* is characterized by various *degrees of order*. The transition between different types of order is given by the associated level of complexity.

Definition 6 *There are three* **degrees of order** *in the* world of complexity*:*

- *the* structural order*, having three forms:*
  - *the* formal structure*: a perfect order, characterized by a small algorithmic complexity*
  - *the* fractal structure*: a hidden order, having a small hidden algorithmic complexity (for those who know the simple rule that generates an apparent complex form) and an high* apparent complexity
  - *the* physical structure*: an approximate order characterized by* significant representations *based on* semantic complexity
- phenomenological order *that contains meanings without any structural order, having a high* semantic complexity *and a* significant representation *with a minimal equivalence class associated*
- random (dis)order *in which does not exist any order, with maximal* algorithmic complexity *and minimal* semantic complexity.

$\diamond$

Definition 7 *The* **chaos** *is a reality in which all the three degrees of order are simultaneously possible.* $\diamond$

The properties of chaos are discussed in [Gleick '87]. Symmetrically, we can discuss about the degree of chaos in the order of world. The pure chaos and the genuine order are only theoretical limits never reached.

Definition 8 *The* **fluctuation** *is the main property of chaos to partially switch between degrees of order.* $\diamond$

The *fluctuation* is the "state" of chaos. Else, it is the single perpetual process in chaos, responsible for all the significant events occurred in it. The eternal behavior of chaos consists in fluctuations. We don't have explanations for this behavior, but we must *postulate* it because there are not another solutions. Indeed, we believe that the fluctuation is the simplest form of behavior for the most of the algorithmic complex realities with no semantic complexity.

The main effect of fluctuation in chaos can be a partial structural order. In one or many "places" in chaos appear "temporary" islands of order. The order does not fluctuate. We must find a specific behavior for the ordered domains. This specific behavior will be defined as an *interacting process between the structural order and the random (dis)order*. Following a computational suggestion we will call this process **interpretation**.

5 The Interpretation: the Main Mechanism in the World of Complexity

The order, once occurred, generates a local coherence. The random behavior is restricted by the order that has an "attitude" against the chaotic. But, what can be the interaction between the order and the chaos? We know that only things interact. The degree of orders are not things. Remind us that we are in the one-dimensioned space of the complexity in which only the degree of order is accessible. The nature of the entity "transferred" between different degrees of order is not so easy to be specified. Therefore, after the first postulate, concerning the *fluctuation*, we must introduce a second postulate defining the *interpretation*.

Definition 9 *The* **interpretation** *process is the reaction of the order to the non-order in the chaotic medium, generating:*

- *supplementary order, by a strong* classification *mechanism applied to the random (dis)order, actualized in* **structures** *having the algorithmic and/or semantic complexity smaller than its crude complexity*
- *phenomenological order, actualized in* **phenomena** *with high semantic complexity,* mixing *structural order with random (dis)order*
- *pseudo-random (dis)order with high apparent complexity.*

◇

About supplementary order and a kind of degenerated chaos, the real novelty brought by the interpretation is the *phenomenological order*. This is the most "expressive" order because of its high semantic complexity. The "content" of the phenomenological order is *in-formal*, i.e., it must be interpreted in order to be accessible.

Once occurred, the phenomenological order generates a new behavior into the chaos. We call it: **action**.

Definition 10 *The* action *is a fluctuation introduced* directly *by the phenomenological order or intermediated by the* interpretation *performed by structures on the phenomenological order.* ◇

The mechanisms emphasized until now are summarized in Figure 3, where the three "stages" of chaos are presented:

1. the genuine *fluctuant* chaos free of any kind of order
2. the partial ordered, *interpretative* chaos generated by fluctuation
3. the full chaos in which structures, pseudo-chaos, phenomena and genuine chaos coexist having a triadic behavior consisting in fluctuations, interpretations and *actions*.

The phenomenological order is generated in two stages:

the first stage resulting only from the interaction between the order and the random (dis)order

the second stage in which the new mechanism of *action* is involved.

Therefore:

- the *chaos fluctuates* generating order randomly
- the *structure interprets* the less ordered entities generating more order, phenomena or pseudo-chaos
- the *phenomenon acts* directly or by interpretation through structures.

If the phenomenon acts through interpretation, then its semantic complexity achieves **meanings** converted in actions by the interpretative structures. Thus, a new very important entity is emphasized: the **phenomenological information**.

6 The Phenomenological Information

The phenomenological becoming, determined by actions, is a specific process in the chaotic world of complexity. It is like the chaotic fluctuation but is developed only in phenomena. Rather than genuine chaos which does not contain meanings, the phenomenological part of the full chaos, because of its semantic complexity, carries meanings. Therefore, the phenomenological becoming implies the dynamic of meanings driven by meanings. But, "the meanings in action means information" is another suggestion offered by computer science [Ştefan '91] to those who believe in the persuasion of the computational paradigms.

What is the content of the phenomenological order actualized in phenomena? The answer is: *the meaning acting as information.* The information is the manifestation of the in-formal content of the phenomenological order.

Definition 11 *The* **phenomenological information** *is the meaning of the phenomena that acts by interpretation in the world of complexity.* $\diamond$

This definition is convergent with the definition given by Mihai Drăgănescu for the phenomenological information in [Drăgănescu '84]. He defines the phenomenal information by $< \sigma >$, where σ is the *phenomenological sense* without any structural support.

The phenomenon is a mixture of order and non-order having a meaning that recalls. Between chaos and order, the phenomenon has more than signification, it has sense that recalls, sometimes in a strange manner, beyond the current interpretations. In this respect the phenomenon seems to be a reality characterized by uniqueness. We have no rules in order to construct phenomena. A phenomenon can be a rule used for generating something, but we don't have a rule to "build" it. Once again, we are positively "oppressed" by a computational suggestion. Indeed, a program represents a rule, but we have no rules for building programs (we have only rules for expressing them correctly). Almost each non-trivial program has its uniqueness, leading our thought toward the idea of phenomenon.

The ordered part of the phenomenon guides the interpretative process (toward structural order, toward phenomenological order or toward pseudo-chaos) in order to valuate its non-ordered part. The ordered part doesn't have any meaning, but offers a formal, simple support on which the phenomenal meaning manifests. Without this kind of lattice as "support", the uniqueness of the non-formal order becomes unreadable. This is the reason for which the order is prior to phenomenon in the chaotic becoming.

The phenomenon rises, in the *first stage*, from *chaos & structural order* by interpretation. In this stage the information is not involved, the structural order interprets only the chaotic (dis)order. Only in the *second stage* the structural order interprets the informational content of the phenomena.

The *phenomenological becoming* characterizes only the *second stage* of the generation process in the phenomenological order. In this stage the *action* is responsible for the most significant processes.

Definition 12 *The* **phenomenological becoming** *is the result of the action performed by a phenomenon on itself in the chaotic world.* ◇

The information acts on the phenomenon containing it. Let us remember that the action is a kind of interpretation: a structure interprets the information. Therefore, the *phenomenal becoming* supposes phenomena, structures and a **loop** that partially modifies the phenomena. The phenomenon acts on itself by a loop "closed" through a structure.

The *loop* in the *world of complexity* seems to be a strange entity, because the loop is thought as a connection between physical structures. Here, in the world of complexity there are not physical structures to be loop connected. Consequently, a specific form of loop must be defined: the **semantic loop**.

Definition 13 *The* **semantic loop** *in the world of complexity is an action, performed by a phenomenon on itself and mediated by a structure.* ◇

The *world of complexity* can be seed as a form of the **primary background** [Drăgănescu '98]. Therefore, the *phenomenological information* will be the *deep information*: the source of the *phenomenal becoming* driven by the *semantic loops*.

7 Conclusions

In this paper only the "first level" of the five fundamental mechanisms, leading towards the **phenomenal becoming**, were described: the *fluctuation*, the *interpretation*, the *action*, the *information* and the *semantic loop*.

This model is suggested by many mechanisms characteristic for the computational systems. For example, the interpretation mechanism acts in computer systems under the form of the `interpreters` (a microprogrammed machine is an `interpreter` for programs written in the machine language). Also, many philosophical thoughts promoted concepts suggesting the fluctuation process.

The word of complexity is chaotic and its evolution can be summarized as the phenomenal becoming followed by the temporary settlement in structures.

The way toward the **meaning** starts in the *world of complexity* and is given by a play between the, before known, *fluctuant chaos* and the, just introduced, *interpretative order*.

Future works starting from this paper will suppose:

1. the structuring and "phenomening" processes must be emphasized as structural-phenomenological "mechanisms"

2. the *language*, as phenomenological generator, will be studied (even in computer science a program is sometimes a phenomenon because we have not rules to conceive it, we have only rules to correctly express it)

3. the *non-linearity*, as a form of sensitiveness, becomes a central concept when the complexity and the space-temporal structures will be considered together

4. the *time* as the effect of the irreversible order (the way from chaos to order and backwards does not recover the initial chaos, because, the non-linearity of existence promoted an unforgiveness function: the *memory*)

5. the nuanced form of interpretation:

   - execution: the weak, syntactic interpretation
   - interpretation: related to signification
   - hermeneutics: the strong interpretation related to senses

6. the nuanced form of relations between meanings and structures:

   understanding - interpreting - contemplating

   as the fundamental ability of man to use:

   concepts - values - revelations

7. the *minding "mechanism"* is the most important target to be achieved starting from the *fluctuation & interpretation & action* mechanism.

And finally, a very important problem remains to be solved: is it, the **world of complexity**, a real deep level of existence? Or is it only a good working model? If the *world of complexity* is the deep level of existence, then, the *phenomenal becoming* is the consequence of the deep information's interpretation, else, the *phenomenological becoming* remains to be at least the partial result of information's interpretation.

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