INFORMATION IN THE STRUCTURAL - PHENOMENOLOGY OF MIHAI DRĂGĂNESCU[1]

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ABSTRACT:

How Mihai Drăgănescu's philosophy is positioned in the 20th century philosophical development? We will try to prove that the synthesis he proposed in his first philosophical book - *The Depth of the Material World* - reunited the main divergent currents emerged in the beginning of the 20th century under the pressure of the Kantian challenging heritage. The *structural-phenomenological synthesis* was made possible only taking into consideration the ubiquitous *information*. The intermediate way proposed by Wittgenstein for the same problem was surpassed by means of information, this concept relentless imposed in the second half of the last century. Drăgănescu's synthetic definition of information is an integrative instrument able to cover insightful approaches in many domains.

KEYWORDS: Information, phenomenology, raționalism, empiricism, structuralism.

The Kantian heritage

At the end of 18th century Immanuel Kant succeeded to reconcile empiricism and rationalism proposing a new and coherent theory of knowledge. In order to provide a unified approach he was obliged to impose meaningful distinctions, such as *analytic – synthetic, phenomenon – thing in itself, a priori – a posteriori*, which helped him to emphasize the human knowledge as having two distinct aspects: (1) the sensory and empirical approach, he called **intuitions**, and (2) the process of understanding based on what he called **concepts**.

The Kantian synthesis generated, according to the previously emphasized distinctions, a three-dimension space, let us call it the **Kantian knowledge space**. It is represented in Figure 1, where two meaningful, disjunct "volumes" are associated, one to what can be called the **noumenal** domain and another to what can be called the **phenomenal** domain. It is about the domain dominated by *pure intuitions* and the domain dominated by *empirical intuitions*. The rational approach is largely represented in the noumenal domain, while the empiric way of knowledge is largely covered

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in the phenomenal domain. The connections between the two domains are too little captured in the Kantian model of knowledge. This could be the main weakness of the Kantian approach.

The distinctions *analytic – synthetic* and *a priori – a posteriori* provide the following four types of judgments:

1. *analytic a priori* judgments provide the main body of the rationalist theories; we must agree, they include all pure and simple logical truths and they are necessarily true as they consist mainly of straightforward definitions;

2. *synthetic a posteriori* judgments allow the development of pure empirical theories; they are by the rule the uncontroversial matters of fact we usually know by means of our sensory experience;

3. *synthetic a priori* judgments cannot be proved as true by analyzing them, and in the same time their truth is independent of any experience; they constitute the most important cases, because only they could provide new necessarily true knowledge;

4. *analytic a posteriori* judgments cannot arise, because we never use the experience to support an explicative assertion.

No one before Kant considered the possibility of the *synthetic a priori* judgments. Thus, Kant did something that is beyond a simple integration of the rationalistic and empiric ways of knowledge, he added a new dimension neglected by many of his followers toward the end of 19th century. Kant understood that integrating means also to add something (he added the *synthetic a priori* judgments), not only simply putting together the *synthetic a posteriori* judgments and the *synthetic a priori* judgments.

We have the feeling that the three distinctions (analytic – synthetic, phenomenon – thing in itself, a priori – a posteriori) generated a too harsh disjunction, between the pure intuitions and the empirical intuitions, which a century after the publication of the *Critique of Pure Reason* (1781) restarted the debate on the intuition as a reaction to the Kantian approach. The disjunction acts inside the same knowledge system generating an internal tension which will divide the Kantian followers as soon as new evolutions will challenge the philosophy of knowledge.
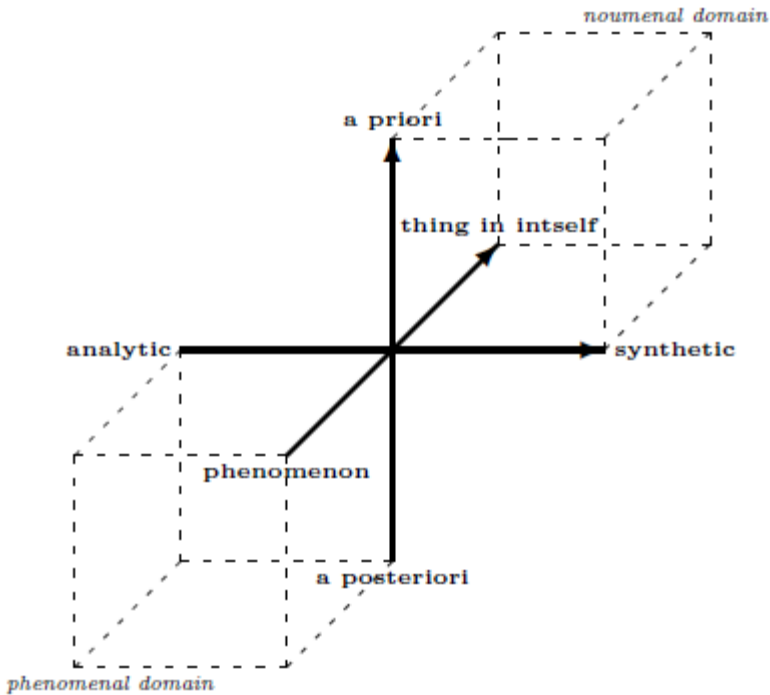
Fig.1 The Kantian knowledge space. *(figure labels: noumenal domain, a priori, thing in intself, analytic, synthetic, phenomenon, a posteriori, phenomenal domain)*

Fig.1 The Kantian knowledge space.

The anti-Kantian movement at the end of 19th century

The debate on the alternative empiricism – rationalism restarted at the end of 19th century after a long series of meaningful developments in the history of science. Electro-magnetism (Michael Faraday; James Clerk Maxwell's 1773), evolutionism (Charles Darwin, 1859), non-Euclidean geometries (Carl Friedrich Gauss, 1818; Janos Bolyai & Nikolai Ivanovich Lobachevsky ~1830; Bernhard Riemann, 1854), logic (George Boole, 1847), thermodynamics (Sadi Carnot, 1824; Ludwig Boltzmann, 1877) are only few of the knowledge domains where spectacular developments re-questioned the relation between empiricism and rationalism. Let us take only the example of electro-magnetism where two people, with a very different background, contributed essentially to the foundation of the

domain. The contribution of the empirical experiments made by Faraday and the mathematical synthesis of Maxwell strongly questioned the Kantian model of knowledge development.

Thus, around 1880 the discussions about the median term of Kant, *intuition*, generated an anti-Kantian movement developed on two distinct lines which will mark the next century of philosophical debates. The initiators of these two lines of thought were Gottlob Frege (1848-1925) and Edmund Husserl (1859-1938). The first will reject intuition, while the second will give to intuition another meaning.

Gottlob Frege

Under the pressure of the abstract constructs, emerging mainly in mathematics, Gottlob Frege published in 1879 his first important opus, *Concept-Script: A Formal Language for Pure Thought Modeled on that of Arithmetic*. This is the first attempt of freeing mathematics from the natural language, by reformulating it in terms of logic. Thus, he parented what will be called in the next century the analytic philosophy by this book which is considered a turning point in the history of logic. He continued his approach in *The Foundations of Arithmetic: the logical-mathematical Investigation of the Concept of Number* published in 1884 and *Basic Laws of Arithmetic* published in 1893 (vol. 1) and 1903 (vol. 2). Frege's aim was to provide a deductive system completely free from the use of intuition. He dreamed for the moment when "one may not appeal to intuition as a means of proof". Doing so, he was somehow a forerunner of David Hilbert in calling his fellows mathematicians to find the solution for the decision problem.

By his program, Frege rejected the important role Kant offered to *intuition*, claiming that Kant ignored both, Raymundus Lullus (*Ars magna*) and Gottfried von Leibnitz (*characteristica universalis*). By his "concept-script" or, more clear, "writing of concepts", Frege argued for a mechanical (logic or formal) resolution of mathematical problems. No intuition, or at least a secondary role for it, because he accepted Kant's view of geometry as being synthetic *a priori*, but rejected Kant's view that arithmetic is synthetic and claimed that arithmetic is analytic.

With Frege we are back to a sort of mechanistic rationalism which, surprisingly, despite of its reductionist flavor, culminated in the most important negative result in the history of science: *Gödel's incompleteness theorem*. Thus, Frege opened the way toward the emergence of the

information based approach as the main conceptual environment for the second half of the 20th century.

Edmund Husserl

Husserl goes back to the original meaning of the term *intuition*. In Latin language *intueri* stands for *to look inside*, or "perception *via* the unconscious", to use Carl Gustav Jung's phrase. While Frege stressed the rational approach digging too much in the *noumenal domain*, Husserl lands on the complementary *phenomenal domain*. He starts the knowledge process looking inside. Its approach has three stages:

- 1st stage: the eidetic reduction is a **closing in itself**;
- 2nd stage: intentional function recreates the link between consciousness and object as on **opening into itself**;
- 3rd stage: **reopening** toward the inter-subjective world.

The key concept in this process of "looking inside" is **intentionality**, the mental phenomenon disclosed in 1874 by the German philosopher Franz Brentano (1838-1917) in his work entitled *Psychology from an Empirical Standpoint*. The meaning associated by Husserl to intuition is strongly related with the idea of intentionality.

Husserl's phenomenology will evolve in parallel and independent to the analytic philosophy. It will develop in few ways. The most important thread is the *existential phenomenology* represented by Martin Heidegger (1889–1976), Jean-Paul Sartre (1905–1980), Hannah Arendt (1906–1975), Maurice Merleau-Ponty (1908–1961), Paul Ricoeur (1913–2005).

The new disjunction

Unlike the analytic philosophy, focused on how the knowledge is generated and how it spreads in community, the phenomenological approach is focused on the inner process of knowledge of each individual. Somehow, the phenomenal and the noumenal domains become more separated. Now, instead of one philosophy of knowledge manifest in two domains, we are faced with two distinct philosophical approaches. Proven fragile, the Kantian reconciliation is broken. The *rationalistic versus empiricist* approach is substituted by the *analytic versus phenomenological* approach. The gap is enlarged, because the analytic approach is an extreme rationalistic one, while the phenomenological attitude is also an extreme empiric attitude. We try to explain how this split was possible by the fact that both sides ignored the crucial importance of the *synthetic a priori*

judgments. Frege overestimated the role of the analytic a priori judgments, while Husserl paid too much attention to the synthetic a posteriori attitude, and both disregarded the synthetic a priori entities.

Thus, till the middle of the 20th century the two schools of thought struggled unsuccessfully to provide the "right" way of knowing. Ludwig Wittgenstein (1889-1951) an active player in this effort tried to re-integrate the two too divergent ways of the knowledge process.

Wittgenstein's tentative middle way

In *Tractatus logico-philosophicus* (1922) Wittgenstein starts closer to Frege (because he was focused on the technical problems of language) than to Husserl, under the influence of the formal-based approach promoted by Bertrand Russell. He emphasized fundamental limits, such as:

- philosophy is an activity, not a body of doctrines;
- metaphysics is possible, but not as discourse;
- any kind of language has a limited use.

He can not be considered as part of the analytic school, although his anti-metaphysical attitude supported the logical positivists of the Vienna Circle.

Eventually, in *Philosophical Investigations*, Wittgenstein ends closer to Husserl's "inter-subjective world". In a less technical discourse, he preaches now, instead of insurmountable limits, about few possible openings:

- the mathematician is not a discoverer he is an inventor;
- mathematics is an empirical science;
- learning and speaking is a *game*.

Wittgenstein's philosophy is considered of the same importance as of Kant by its line of thought which connects a critical attitude with a constructive one. From philosophy, seen as activity, to speech, practiced as a game, Wittgenstein's thought is an almost successful tentative of integrating the mental acts of the noumenal domain with the mental acts of the phenomenal domain. Why "almost successful"? Because the problem of the *synthetic a priori* judgments remains untouched. It was only avoided. Unfortunately, Wittgenstein died too early. He died two years before two meaningful events:

- IBM started manufacturing in quantity IBM 701, the first large-scale electronic computer;

- Francis Crick and James Watson discovered the structure of DNA molecule.

Almost synchronously, technology and science started to point toward something very deep and important for understanding how our mind works: *information*.

Mihai Drăgănescu's synthesis

In 1978 Mihai Drăgănescu surprised the Romanian scientific community with a communication held at Politechnic Institute of Bucharest: *Architecture and Structure in Open and Introopen Systems*[3]. Follows a a long series of papers and books[4] in which the electronic engineer Mihai Drăgănescu proposed the **structural - phenomenological synthesis** mediated by the concept of **information**.

The useful distinction, at the beginning of the XX-th century, between the structural approach (initiated by Gottlob Frege and Ferdinand de Saussure) and the phenomenological approach, degenerated, toward the end of the century, into a blocking disjunction. The very critical post-modern attitude was unable to provide a solution to avoid those too opposite ideologies, one of the simplicity of the external forms and another of the complexity of the internal states. Drăgănescu's proposal is to consider the knowledge process an informational process with two complementary aspects: structural and phenomenological.

An important step in Drăgănescu's synthesis is his proposal of a frame theory of information.

General information theory

Starting with the seminal work of Claude Shannon, the information theory was widely developed with emphasis on the quantitative aspects only. Mihai Drăgănescu proposes a general theory[5] briefly exposed informally in the following.

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[3] Mihai Drăgănescu: *Arhitectură şi structură în sisteme dechise şi introdeschise*, preprint, ICCI, 1978.

[4] Mihai Drăgănescu: *Profunzimile lumii materiale (The depths of the material world)*, Editura Politică, Bucureşti, 1979.

Mihai Drăgănescu: *Ortofizica (Orthophysics)*, Editura Ştiinţifică şi Enciclopedică, Bucureşti, 1985

[5] Mihai Drăgănescu: "Information, Heuristics, Creation" în I. Plauder (ed.): *Artificial Inteligence and Information Control Systems of Robots*, Elsevier Publishers B. V. (North - Holland), 1984, pp. 25-28.

The general information is the couple:
$$N = <S, M>$$
Information emerges from the association of two entities:

- S: a physical (for example a set of stream of atoms) or symbolical (for example, a set of streams of characters) structure having an internal syntactic order;
- M: the meanings associated to the components of S.

N is detailed as follows:
$$N = <S, <G, \sigma>> = <S, <<R, C>, \sigma>>$$
where:

- G: is the significance, with its two aspects:
    - R: reference significance;
    - C: context significance.
- σ: is the phenomenological sense.

Starting from this general definition, we can detail the following particular forms:

- syntactic information: $N_0 = <S>$
- semantic information: $N_1 = <S, <R, C>>$
- phenomenological information: $N_2 = <S, \sigma>$
- pure phenomenological information: $\boldsymbol{N_3 = <\sigma>}$

From the philosophical point of view the ***pure phenomenological information*** is the most important. It is about a deep "companion" of matter. In order to avoid a dualistic approach Mihai Drăgănescu introduced the concept of ***informatter***, as the foundational entity of existence.

Pure phenomenological information and synthetic a priori judgments

We hypothesize that the deep pure phenomenological information, as co-entity in informatter, provides the source for the synthetic a priori judgments, the main ingredient for integrating knowledge.

Because the human brain is the place where, as far as we know, informatter manifests with maximal efficiency, it is the most appropriate environment for the emergence, in the noumenal domain, of judgments which are, in the same time, independent of experience (*a priori*) and able to synthesize (extract) new knowledge using the *introopenness* informational web.

Thus, the concept of information, with its special form of pure phenomenological information, is able to provide that unifying principle able to put together *analytic a priori (analytic, formal-structural), synthetic*

a posteriori (phenomenological) and *synthetic a priori judgments*. Roughly speaking, *analytic a priori* judgments are used in N_0 and N_1 information domain, *synthetic a posteriori* judgments are dealing with N_2 information domain, while N_3 type of information is responsible for *synthetic a priori* judgments. The Kantian project seems to have now a solid foundation in Drăgănescu's structural-phenomenology.

The medium term introduced by Mihai Drăgănescu – the information – is able to "interconnect" in a unitary approach the formal-structural approach of the analytic school of philosophy with the various forms of phenomenological philosophies and with, what the 20th century philosophy tried to avoid, the very difficult problem of the *synthetic a priori* judgments.

Information became in the last few decades a central topics in various approaches more or less philosophical. But, in my opinion the concept was and it is used mainly at its structural level only, as N_0 and N_1, rarely as N_2.

Philosophy of information

Let us review the most important aspects of the philosophy of information as it is shown in the Western approach. The philosophy of information occurred and developed as a consequence of the emergence of the technical (Claude Shannon (1948)) and mathematical (Ray Solomonoff (1960), Andrey Kolmogorov (1965), Gregory Chaitin (1966)) domain of information with all is socio-psychological and economical followings. Shannon's approach is from the point of view of data communication theory, while the three independent works of Solomonoff, Kolmogorov and Chaitin refer to the complexity "carried" by a stream of data.

Karl Popper's third world

In 1978, Karl Popper (1902-1994) lectured[6] about the *third world* he defined as the sum of the products of thought: scientific theories, stories, myths, social institutions and works of art. Indeed, he defined the world of the informational products, including only information belonging to N_0, N_1 and, partially, N_2. He extended the domain of information beyond the technical domain of communication, but he didn't pay enough attention to

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[6] Karl Popper: *Three Worlds*, The Tanner Lecture on Human Values, delivered at The University of Michigan on April 7, 1978

the phenomenological information and completely ignored the deep pure phenomenological information, $< \sigma >$.

Popper's third world cannot be considered as the information domain because his taxonomy[7] containing:

- world 1: the world of physical objects and events, including biological entities;
- world 2: the world of mental objects and events;
- world 3: objective knowledge,

considers mental events, with their strong informational content, in world 2, while informational aspects from biology and physics are completely ignored.

Thus, Popper's vision is not one to be considered as of a forerunner in the philosophy of information. It is confusing and lacunar.

Luciano Floridi's philosophy of information

Luciano Floridi (b. 1964) refers in his approach exclusively to the third worlds of Popper. According to his definition[8]:

"*The philosophy of information may be defined as the philosophical field concerned with*

- the critical investigation of the conceptual nature and basic principles of information, including its dynamics, utilization and sciences, and
- *the elaboration and application of information-theoretic and computational methodologies to philosophical problems*."

He uses the word "information" sometimes too metaphorically, sometimes too abstractly so as the meaning remains unclear and limited to what Mihai Drăgănescu calls *structural information*. In the philosophy of information developed by Floridi and his followers information is an emergent process rather than a foundational co-principle.

John Archibald Wheeler's "It from bit"

In 1990, the physicist John Archibald Wheeler (1911-2008) suggested that information is fundamental to the physics of the universe[9].

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[7] http://en.wikipedia.org/wiki/Popper's_three_worlds
[8] http://www.illc.uva.nl/HPI/Modern_Trends_in_Philosophy_of_Information.pdf
[9] John A. Wheeler: "Information, physics, quantum: The search for links", in W. Zurek, *Complexity, Entropy, and the Physics of Information* (Redwood City, California: Addison-Wesley), 1990

According to its "*it from bit*" doctrine, all physical things are information-theoretic in origin:

　　　"**It from bit**. *Otherwise put, every it — every particle, every field of force, even the spacetime continuum itself — derives its function, its meaning, its very existence entirely — even if in some contexts indirectly — from the apparatus elicited answers to yes or no questions, binary choices [52][10], **bits**.*"(p. 310)

　　　Wheeler proposes in the same paper, independently, one decade after Drăgănescu's existence ring, a sort of similar loop:

　　　"*To endlessness no alternative is evident but loop, such a loop as this: Physics gives rise to observer-participancy; observer-participancy gives rise to information; and information gives rise to physics*." (p. 313)

　　　Unlike Drăgănescu, to whom information is a co-existent principle in deep reality, Wheeler considers information as rising in a sort of "individuation" process in existence. But, as far as I know,　Mihai Drăgănescu considered John Wheeler's approach as very supportive for its own theory.

　　　For Wheeler information comes only in bits, while for Drăgănescu bit-shaped information is only one form of information, manifest mainly as the structural information. The deep pure phenomenological information is beyond of the distinction continuous-discontinuous.

Lee Smolin and the deep informational process

　　　After another decade, the theoretical physicist Lee Smolin (b. 1955) claims that the universe is made of informational processes instead of pure things[11] :

　　　"*The flow of information around the circuits of a computer constitutes a story in which events are computations and causal processes are just the flow of bits of information from one computation to the next. This leads to a very useful metaphor - the universe as a kind of computer. But it is a computer in which the circuitry is not fixed, but can evolve in time as a consequence of the information flowing through it.*" (p. 56)

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[10] J. W. Tukey: "Sequential conversion of continuous data to digital data," Bell Laboratories memorandum of 1 September 1947 marks the introduction of the term "bit" reprinted in *Origin of the term bit*, ed. H. S. Tropp (Annals Hist. Computing 6 (1984) 152-155.)
[11] Lee Smolin: *Three Roads to Quantum Gravity*, Basic Books 2001.

"*This means that the world is not made of stuff, but of processes by which things happen. Elementary particles are not static objects just sitting there, but processes carrying little bits of information between events at which they interact, giving rise to new processes. They are much more like the elementary operations in a computer than the traditional picture of an eternal atom.*" (p. 63)

Smolin's information is inspired also form our IT environment, from which it borrows the discreteness and the computational aspects.

As a starting point, in accepting information as an important factor in understanding the essence of our existence, Smolin's approach is supportive, but it is somehow limited. For Mihai Drăgănescu information could have continuous aspects and its main deep behavior is transcomputational.

Quantum entanglement

One of the hottest moment in the glorious debate between Einstein and Bohr was spent in 1935 when the famous EPR paper[12] as published. It is about what we call now the *quantum entanglement phenomenon*, the only physical process, disclosed for us by the quantum mechanics, that gives us the hope that there is existential plenitude. In 1935, Albert Einstein guessed it in the EPR paper, but he did not believe it is possible, John Bell reformulated it in 1964 so as an experiment to be possible, in 1982, Alain Aspect proved it experimentally[13], but close no one still manages to accommodate mentally with its existence.

The pure phenomenological information could be proposed as the concept able to provide an explanation to the Einstein's "spooky action". If the deep existence is *informaterial*, then there is a chance that the structural-phenomenological frame theory could be developed in order to provide the means to explain the entanglement phenomenon.

To achieve this goal, the information theory must be developed in order to integrate, at least, continuity and trans-computability.

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[12] A. Einstein, B. Podolsky, N. Rosen: "Can Quantum-Mechanical Description of Physical Reality be Considered Complete?". *Physical Review*, **47** (10): (1935-05-15). 777–780.

[13] Alain Aspect, P. Grangier, and G. Roger, "Experimental Realization of Einstein-Podolsky-Rosen-Bohm Gedankenexperiment: A New Violation of Bell's Inequalities", Physical Review Letters, Vol. 49, Iss. 2, pp. 91–94 (1982)

The FQXi site

The scientific community moves, increasingly faster, in building small communions focused on integrating various theoretical directions in order to provide new perspective for understanding what existence is. One of the most promising is FQXi[14].

A meaningful event spent in this context is the conference held by Professor Ian Durham at *Saint Anselm College*, NH, on "Contextuality: Wheeler's universal regulating principle"[15], where he claims:

"*... it seems quite logical to conclude the exact opposite of Wheeler – 'bit' actually comes from `it'...*"

From "it from bit" to "bit from it" in almost a quarter of century! Then, why not:

"It & bit"

as a *small & simple & clear* form to express the idea of Drăgănescu's ***informatter***. Information and matter are so tightly entangled than cannot be "one from another"; only "it & bit" is able to express, in current terms, the old and fruitful intuition of ***homoiomerous*** and of ***nous*** which Anaxagoras (c. 510 – 428 BC) has had.

Concluding remarks

The aim of this paper was to frame the information based structural-phenomenology of Mihai Drăgănescu in the European philosophical debate of the last more than two centuries. We started from Kant's view on the knowledge process because we believe that the main problems raised in *Critique of Pure Reason* find their solutions only by considering the information as a fundamental existential entity.

Fundamental problems that occurred in contemporary science, mainly in quantum mechanics, can find their solutions by a structural-phenomenological approach based on a new, enlarged, theory of general information.

The dualistic approach of the majorities of the European philosophies is melted in the "***it & bit***" approach which is able to provide the most promising "embodiment" for the Plotinian ***One***.

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[14] http://www.fqxi.org/community
[15] http://fqxi.org/community/forum/topic/1896 and then:
  http://fqxi.org/data/essay-contest-files/Durham_FQXi4.pdf

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[3] http://www.fqxi.org/community

[4] http://fqxi.org/community/forum/topic/1896   and then: http://fqxi.org/data/essay-contest-files/Durham_FQXi4.pdf

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[13] http://en.wikipedia.org/wiki/Popper's_three_worlds

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