

Article

Three Aspects of Information Science in Reality: Symmetry, Semiotics and Society

Joseph E. Brenner

International Center for Transdisciplinary Research, c/o Chemin du Collège 1, CH-1865 Les Diablerets, Switzerland; E-Mail: joe.brenner@bluewin.ch; Tel./Fax: +41-24-492-2118

Academic Editors: Mark Burgin and Wolfgang Hofkirchner

Received: 14 August 2015 / Accepted: 12 November 2015 / Published: 17 November 2015

Abstract: The 2nd International Conference on the Philosophy of Information (ICPI 2015) took place in Vienna June 5–6, 2015 as a major Section of the Vienna 2015 Summit Conference on the Response and Responsibility of the Information Sciences. At the ICPI, Wu Kun and others presented evidence for a current integration and convergence of the philosophy and science of information, under the influence of the unique characteristics of information itself. As I have shown, my extension of logic to real systems (Logic in Reality; LIR) applies to and explicates many of the properties of information processes. In this paper, I apply LIR as a framework for understanding the operation of information in three areas of science and philosophy that were discussed at the Summit. The utility of this approach in support of an information commons is suggested the abstract section.

Keywords: convergence; information; logic; philosophy; science; semiotics; society; symmetry

1. Introduction

1.1. The Vienna Summit 2015 Conference on Information

As a contribution to this Special Issue, this paper takes seriously the mission of the Vienna Summit: establish the necessary responsibility of and response from the information sciences in support of an information commons. In my approach summarized below, the role of information science and its actual or potential impact is more or less direct or indirect. I note that the integration of a social purpose in scientific studies is a practice that has not received a stable commonly accepted format for expression. I hope nevertheless that the “experimental” aspect of this essay may be an acceptable basis for further discussion and research.

1.2. Rationale and Outline of Paper

There are today several attitudes, negative as well as positive, that be taken toward the statement that information is the locus of a revolution in philosophy and science. In prior work [1], I have shown that my proposed extension of logic to real complex processes, Logic in Reality (LIR) provides tools for the understanding of change in general. This paper attempts to provide a logical-ontological framework for discussion of the changes in philosophy and the Philosophy of Science that are occurring from the incorporation of concepts from Information Science.

In this paper, I refer to three areas of knowledge in which a convergence between science and philosophy, pointed out by Wu Kun [2], can be seen. I will refer to them as:

- Symmetry: grounding information in physics
- Semiotics: information in relation to signs
- Society: information as a social operator

I realize that with such a design, it will not be possible to explore each of these areas in depth. My hope is that this will be offset by the opportunity to see some of the connections and overlaps between these domains that have, in my view, a role in how knowledge should be approached.

I begin the paper (Section 2) with a brief discussion of some concepts of what science and information are. Section 3 presents two major doctrines as components of the current philosophical-scientific context to this paper. I then provide the minimum outline of Logic in Reality necessary for the understanding of my positions (Section 4). Sections 5–7 correspond to the three broad areas indicated. Section 8 provides some examples from the current literature which illustrate the convergence. I conclude with some expectations about possible further impact of the “scientification” of philosophy and the “philosophization” of science.

2. Positioning the Philosophies of Science and Information

2.1. What is Science?

The impact of information on science, via the Information and Communications Technologies (ICTs), is a complex process in which “science” should not be viewed as a single discipline; any impact will depend on what sciences being discussed. I thus characterize two aspects of science: (1) its rough segmentation along the lines of “hard” and “soft”, experimental and conceptual; and (2) the relative independence of different scientific disciplines of both types. It is a statement within the Philosophy of Science and of Information that what links the scientific process, the pattern and the content of the sciences, including that of information itself, are their informational characteristics.

The concept of scientific method is only one of those meaningful in the contemporary practice of science. Computational methods can be and are applied routinely in all the sciences. In the human domain, it is the application of operative or organizational principles to an individual or social cognitive process to determine its dynamics, what “forces are at work”, that I consider essential for the determination of an informational commons.

2.2. What is Information?

Information is an entity or process, or set of entities and processes, that is unique in both science and philosophy. It requires acceptance as a concept that cannot be defined as an identity but only as a dynamic interactive dualism of matter-energy (ontological properties) and meaning (epistemological properties). Cognitive processes, as well as their corresponding analyses and theories, instantiate similar dualities, of which the prime example is that of self and other.

Information is somehow associated with or constitutive of existence, but it has proven notoriously difficult to define and characterize, due to its multiple duality: it has both physical and apparently non-physical components, both real dynamic and algorithmic descriptions. I note that both science and philosophy involve the observation of regularities in nature which only differ in the degree of certainty to which can be ascribed to them. Greater rigor in philosophy does not come easily; however, the properties of information common to both science and philosophy can be used to reconcile the physical, scientific properties of information with its epistemological, philosophical characteristics as a carrier of meaning. Both a physics (science) and mutually consistent philosophy of information are required and that the philosophy and science of information must inform one another.

3. The Theoretical Context

3.1. Transdisciplinarity: Some New Theories

In recent papers, Pedro Marijuan and his associates [3,4] have called for the transdisciplinary incorporation of insights from several sciences, an “intertwining” of disciplines to enable further understanding of information and the foundations of information science. I argue that the Philosophy of Information can be included in this process as a consequence of the convergence of science and philosophy under the influence of information science, due to the properties of information itself.

Some may raise the question of the desirability of this process, but I consider it inevitable. From a philosophical perspective, I consider that the major recent advances in the philosophy of science are almost all related to information in some way. As Wu has now shown [2], the historical development of philosophy in the West left an aporia in the relation of “mind and matter” which an informational approach offers a new way of resolving. There is no reason, however, in this transdisciplinary context, why individual disciplines, including classic branches of philosophy and science, cannot maintain their specificity and methodology.

Information processes are described as involving qualitative and quantitative changes in the amount and value of something irreducibly real in information.

- Terrence Deacon [5,6]: information as “absence”; from dynamics to teleodynamics;
- Luhmann [7]: the Causal-Computational-Concept of information; embedding of the individual human being in an informational reality with a dual structure;
- Hofkirchner [8]: the re-ontologization involved in the different aspects of the informational revolution in progress;
- Brenner [9]: Logic in Reality (LIR); allows inferences about the energetic-ontological properties of information rather than truth-conditions (see Section 4).

3.2. Wu Kun and the Informational Turn

At the 4th International Conference on the Foundations of Information Science in 2010, Professor Wu Kun of the Xi'An Jiaotong University in Xi'An, China published the first compendium in English of his work on the science and philosophy of information [10]. In particular, he indicated the central role of the Philosophy of Information (PI) and its impact on science and the Philosophy of Science (PS). This theory can now be usefully compared to the Philosophy of Information developed independently by Luciano Floridi in Europe [11]. The observation by Wu and myself of the close relation between his theory and LIR was one consequence of that Conference.

At the 1st International Conference on the Philosophy of Information held in Xi'An in October, 2013, Wu presented further work on the mutual impact of the PI on science and philosophy, which he describes as the scientification of philosophy and the philosophization of science [12]. His view is echoed by the Dutch logician Pieter Adriaans who also has observed the major impact of information on philosophy itself.

Wu again presented the major themes of his research at 2nd International Conference on PI held in Vienna in June, 2015 [13]. They included explicitly the idea of the convergence of science and philosophy under the impact of the development of the science and philosophy of information. In this pioneering work, Wu has clearly brought out the ontological impact of information on philosophy. In his recent papers, Wu Kun presents detailed arguments for a new perspective on philosophy and science and the changes which they are undergoing under the influence of the informational activities of the society. I indicate here four position statements that constitute the “backbone” of Wu's metaphilosophical theory:

- Mind-Matter: Dichotomy or Identity

With some notable exceptions, the bulk of philosophical doctrine is still based on the categorial separability of mind and matter. Advances in neurobiology have been made that point toward an apparent mind-brain identity, which unfortunately tends exclusively toward the opposite position. Few would claim that neurobiology has resolved all the logical and philosophical problems of the real relationships between “mind” and brain. Wu's first contribution was to show that the existence of information requires a resegmentation of the existential field, making both the mind-matter dichotomy and identity on which much current thinking is still based untenable.

- The Science-Philosophy Dichotomy

In general, the laws of reasoning and logic have remained isolated from physical science, a part of semiotics. The concomitant acceptance of the philosophical duality of information and the recognition of its physical duality abrogate any absolute separation between science and philosophy. This principle, within the Philosophy of Information (PI), is becoming applicable to science and consequently the Philosophy of Science (PS), as well as philosophy itself.

- The Position of Information in Reality: Properties

Any complex real entity, e.g., a person, can be considered as constituted by the totality of the informational processes, past, present and potential in which he is involved. The intermediate stages which bridge the gap between external and internal reality are all informational. This approach is consistent with Deacon's approach to the hierarchy of dynamics and second-order constraints necessary for the emergence of life.

- The Informational Turn

As a discipline, Information Science has a unity by virtue of its spanning human knowledge from philosophy to science and engineering, with both vertical and horizontal relations between its component sub-disciplines. While the term 'information science' had been used, as a reviewer has pointed out, primarily to refer to documentation, library science and knowledge management in general, especially since the work of Marijuan [3] since the mid-1990s, it has also had the acceptance used here. Further, the integration in progress of Information Science and the Philosophy of Information implies a major Informational Turn in the current practice of both science and philosophy. I will show that Logic in Reality has a major role to play in the informational turn.

4. Logic in Reality (LIR)

4.1. The Fundamental Postulate

LIR is an entirely new kind of non-propositional logic grounded in the fundamental self-dualities and dualities in the nature of energy or its effective quantum field equivalent. It is based on the pioneering extension of logic to real processes of the Franco-Romanian thinker Stéphane Lupasco (1900–1988) [14]. These antagonistic dualities can be formalized as a structural, logical and metaphysical principle of opposition or contradiction instantiated in complex higher level phenomena. The fundamental postulate of LIR is that all energetic phenomena (all phenomena) alternate between degrees of actualization and of potentialization of themselves and their opposites or contradictions (A and non-A; Axiom of Conditional Contradiction) with which they are associated (Axiom of Functional Association) but without either going to the absolute limits of 0 or 100% (Axiom of Asymptoticity). By phenomena here, I, in fact, mean all complex events, percepts, concepts, processes, theories, *etc.* in which there is a substantial degree of interaction or mutual determination. At the mid-point of maximum contradiction or interaction between A and non-A, a new third term or entity can emerge at a higher level of reality or complexity (Axiom of the Included Third or Emergence). This axiom was designated by Lupasco as the Principle of Dynamic Opposition (PDO), which is operative in the dynamic structure of the non-separable and inconsistent aspects of complex entities, processes and events at biological, cognitive and social levels of reality.

4.2. The Structure of LIR. Semantics and Calculus

The LIR logical system thus has a formal part—axioms, semantics and calculus; an interpreted part—a metaphysics and a categorial ontology; and a two-level framework for analysis relating levels of reality and levels of explanation. Regarding its semantics, in classical logic, the function of a standard semantics

is to ensure truth preservation as a basis for the validity of the logical reasoning. In the semantics of LIR, however, sentences do not look like those of a classical logic, and its inferential patterns are different. The semantics of LIR are non-truth-functional in the sense that their elements are not propositions at all, and the concept of truth-functionality (defined as valuations based on homeomorphisms (mappings) between formulas and an algebra of truth functions defined on a given set of values, 0 or 1 in binary logic, several values in many-valued logics) should not be applied. The major aspect of the LIR “dynamic” semantics is to give a sense of the dynamic state of the event, phenomenon, judgment, *etc.* whereby the event is “on the way” more or less as the case may be, between its actualization and the potentialization of its contradiction.

The major consequence of shifting to logical elements that are non-linguistic, defined by the axioms of LIR, is that the dynamic, oppositional relation between two elements will always be expressed by implications. In LIR, the connectives of implication, conjunction and disjunction all correspond to real operators on the parameters of real elements. Accordingly, these operators are, also, subject to being actualized, potentialized or in a T-state. They operate not on theoretical states-of-affairs or propositions, considered as the abstract meaning of statements, but events, relations, processes and properties.

The calculus of LIR is based on the concatenation of implications of implications, an event calculus unlike any to be found in the literature. LIR is neither a physics nor a cosmology, but a logic that enables stable patterns of inference (in a mode closest to, but not the same as, abduction in the sense of Magnani) to be made, albeit with reference to metavariables that are something like non-standard (non-Kolmogorovian) probabilities in which the (abstract) limits of zero and one are excluded. The values of logical values being probabilistic reflects the fact that for any real process in progress (being partly actualized and partly potentialized), there is a probability but no certainty that what is still potentialized will be actualized.

In LIR, processes are constituted by a series of series, *etc.*, of reciprocally determined actualizations and potentializations of entities and their opposites, and emergent states, driven by the overall energy gradient of the universe. Causality, determinism and indeterminism, time and space, parts and wholes, *etc.* receive non-standard interpretations in this theory. Real entities can be described as encoding significant energy in potential form, as capacity for interaction. Both the actual and potential states of particles at lower levels—atoms, molecules, biopolymers, cells, *etc.*—are functional. The residual potentialities of entities at any level are the carriers of the information necessary for upward causation and emergence at the next higher level. This grounds, in basic physics, the concepts of “auto”-catalysis and “self”-organization in evolution and morphogenesis.

4.3. Implications for Philosophy: Non-Separability

Many philosophical arguments depend on some form of absolute separability of dichotomous terms *via* the importation, explicit or implicit, of abstract principles of binary logic exemplified in the use of standard notions of time, space and causality. LIR discusses philosophical problems and physical situations in dynamical terms that do not require abstract categorial structures that separate aspects of reality. The critical categorial feature of the LIR process ontology is the non-separability of opposing phenomena (two theories) or elements of phenomena, e.g., syntax and semantics, types and tokens.

A physics treats systems by assigning them energetic states, and non-separability is a physical principle, functioning at not only quantum but also at biological and cognitive levels and related to holism. Holism is the thesis that the whole is more than the sum of the parts, and non-separability can be defined by the statement that the state of the whole is not fully constituted by the states, properties and relations of the parts. Quantum entanglement, which has now been demonstrated over macroscopic distances for pairs of photons, is the paradigm example of non-separability, but so can be the relation between pairs of human beings.

In LIR, the structure of reality does not depend on any transcendental notion of human experience (Heidegger; the neo-Kantian phenomenology of Petitot). The dynamics of physical processes may be described without reduction. This logic is not that of logical positivism or of Hempel. It is part, rather, of a new ontological turn in philosophy, most exemplified in the work of Wu Kun [12]. LIR allows inferences about the energetic-ontological properties of information rather than epistemic truth-conditions.

Unlike standard bivalent and multi-valent linguistic logics and their mathematical equivalents, LIR is not topic-neutral but founds an ethics. In other words, its application to real processes includes that to real human processes, individual and social, in which moral values are implicit. LIR is therefore relevant to the development of an information commons in which information both has value and is a carrier of value, even at the lowest level as in the concept of Floridi [11] and in more recent work. Accordingly, theories which support or add credibility to the dialectical physical approach of my logical system *ipso facto* also support its application in the ethical domain.

4.4. A Causal-Compositional Concept of Information (CCCI)

A related theory that illuminates key aspects of LIR has been proposed by Gerhard Luhn [7]. In his discussion of his Causal-Compositional Concept of Information (CCCI), the standard definition of information (the reduction of uncertainty) should be modified: the emergence and operation of information is a compositional activity, including inconsistency, paradox, contradiction and incoherence. It closes the gap between our subjective awareness and the objective boundary conditions given to us in the world. In the causal-compositional perspective, information is the overall (set of) rules that define any possible, valid arrangement of elements, and the relations between them.

A direct relationship between energy and information has been established by Luhn in his Causal-Compositional Concept (CCC). The key principles of this metaphysical approach are the following:

- (1) The universe is involved in the continual creation of new states, through the joint operation of the 2nd Law of Thermodynamics and the Pauli Exclusion Principle. I see this process as isomorphous with that of reasoning.
- (2) Reflecting the dualistic structure of the universe, these states can be considered as information, constituted by both energy and the capacity for action resulting from the asymmetric distribution of that energy.

In this conception, the first change of state of any kind in the universe resulted in a non-uniform energy-density distribution, thus a new form. From this follows a Compositionality Principle that states

if that there are fundamental processes in the Universe (the 2nd Law of Thermodynamics; the Pauli Exclusion Principle) and that they interact at all, this principle was itself new irreducible information or a basic principle of the universe, the basis for all subsequent processes of the emergence of form and structure. The new form thus results in a further unequal distribution of energy, and the meaning or content of this new form are the activities which this non-equilibrium distribution of energy induces, which appear as new laws. The universe appears to operate in such a way as to increase the number of new states or laws, that is, information. The evolving universe can inform us about itself as a consequence of our being embedded in it as cognitive agents.

To conclude this Section, I suggest that a trend or tendency, e.g., toward the greater acceptance of non-standard logic in science, is not something that can be proven in ‘hard’ science. Nevertheless, if it is stated rigorously, a dialogue may be possible between the proponents and deniers of the trend. It is a corollary of LIR that both realist and anti-realist positions will always exist, and the reader can judge for him or herself the extent to which the LIR approach adds value to the debate on the following issues surrounding information.

5. Symmetry

5.1. Introduction: The Foundations of Symmetry

Under the leadership of György Darvas [15] and his colleagues, the recent discussion of symmetry has brought out its critical role in the foundations of physics, hence, of science in general. At the Vienna Summit, the Symmetry Track included many goals or questions, of which I discuss two here: (1) What do we consider physical information? (2) What are the roles of different appearances of symmetries in taking a stand on these questions?

In a recent paper [5], I discussed whether information or energy was more fundamental in the universe (cf. Rovelli [16]). My answer was that energy was definitely more primitive than information as bits, but that energy and information as a difference in energy emerged together from an unknown substrate, perhaps the quantum vacuum. Subsequently, energy and information always accompany one another.

5.2. Symmetry-Forming (In the Beginning...)

If we now look at the universe and try to imagine its features prevailing at the real or effective singularity nearest to us, is it appropriate to consider the relation between Symmetry and Asymmetry, defined as the absence of Symmetry, as an abstract one, or was there always real tension or energy exchange between the parts of a system displaying symmetries in a real temporal (energetic) sequence? One of the corollaries of the LIR system is that it is not necessary that these two issues be completely disjunct, unless we are discussing purely formal or abstract geometric Symmetry.

In this connection, I reproduce verbatim part of a recent article in *SCIENCE* about the neutron-proton mass difference [17]:

- The Standard Model of Particle Physics is based on a $SU(3) \times SU(2) \times U(1)$ gauge theory with massless fermions.

- During the expansion of the early universe, the Higgs mechanism broke this symmetry down to $SU(3) \times U(1)$ and elementary particles acquired masses proportional to their couplings to the Higgs field.
- As the universe continued to expand, a QCD transition took place, confining quarks and gluons into hadrons and giving those particles most of their mass.

Now what is not clear is what drove the symmetry-forming process. My proposal for discussion is that indeed a Symmetry “was” more fundamental, but it was so in a state of the universe about which we can only speculate. Assuming it is meaningful to ascribe Symmetry to what as far as we know now was an undifferentiated entity of some kind, singularity or not, one could then say that the “first” Symmetry-breaking was the emergence of particle-fields as we conceive them. We thus have a picture of Asymmetry as being ontologically secondary to Symmetry in our world. Energy, information, Asymmetry and difference all emerged together from an unknown substrate, making the difference that really made a difference! Symmetry then re-emerged (was actualized) when the universe “cooled down”, and the Asymmetry that was potentialized was re-actualized in the evolution of real processes associated with the appearance of mass.

Roger Penrose has developed a Conformal Cyclic Cosmology [18], which describes the possibility of smooth movement from an “old”, diffuse universe to a “new” condensed one via a singularity. Matching of the disparate physical dimensions is possible due to conformal invariance, but as one moves to the new state, the Symmetry of fields corresponding to conformal invariance may not be true in a quantum context, as new rest mass begins to appear. This supports a speculation that the effective singularity, which does not have to be of infinitesimal size in this theory, possesses spherical symmetry which is then broken before the new symmetries appear. This approach seems to me to provide an opening to new forms of foundational theories of information.

5.3. Symmetry, Anti-Symmetry and Asymmetry

Like information, Symmetry is a complex metaconcept with both ontological and epistemological references to phenomena. Following Darvas, I will consider that Asymmetry is the conjunction of Symmetry and Anti-Symmetry. In particle physics, some particles will be characterized by symmetric wave functions (bosons) and others, for example fermions, by anti-symmetric wave functions. The most primitive example of Anti-Symmetry is in the wave functions of fermions (electrons) as expressed in the Pauli Exclusion Principle. Since this principle is ultimate ground of all real physical differences and the formation of complex chemical structures, one can say that our existence, let alone information, depends on that of Anti-Symmetry.

According to the ontological viewpoint we are discussing, symmetries are a substantial part of the physical world, their theories representing properties (capacities for action) existing in nature or characterizing its structure. The epistemological aspect of symmetries is related to our ignorance of laws of nature; we use Symmetry principles to search for and hopefully discover them. Brading and Castellani [19] concede that aspects of Symmetry may be used to support either an ontological or an epistemological account, but I feel the emphasis given here is incorrect. Rather than focusing and/or trying to opt for one or the other, one might consider a picture in which both are partly correct, as suggested by Logic in Reality. As with

information, also, the mind moves back and forth between the aspect of Symmetry which is primarily active or actualized and the other, as above, alternately and reciprocally.

In the next stage of the analysis, I will use another statement by Brading and Castellani to the effect that many physical phenomena can be explained as direct or indirect consequences of (1) Symmetry principles, with an explanatory role based in a hierarchy of physical theories, or (2) Symmetry arguments, used especially in the area of Symmetry-Breaking (Cf. Section 4). Let us try to follow this difference by looking at symmetry-breaking again.

5.4. Symmetry-Breaking

Symmetry-Breaking was first explicitly studied in physics to explain the physical occurrence of phenomena on the basis of the Symmetry-Asymmetry of the situation. Explicit Symmetry-Breaking is a well-studied process in quantum mechanics, for example in parity. Spontaneous Symmetry-Breaking (SSB) will be discussed in another paper in this Conference, but SSB gives a way of understanding the complexity of nature without renouncing fundamental symmetries—or Symmetry as fundamental? In [19], the questions are asked why we should prefer symmetric to asymmetric fundamental laws, in other words, why assume that an observed Asymmetry requires a cause—asymmetric initial conditions or any form of Symmetry-Breaking? In SSB [19], the symmetry of the “cause” is not lost, but is preserved in the totality of the outcomes (the “effect”). This apparent partial overlap between cause and effect should be a signal that the concepts of cause and effect themselves may follow some interactive pattern in their evolution. Following Lupasco, I have suggested [1] a contradictorial picture of cause-effects that applies at both the physical and theoretical levels. Among the classical examples of Symmetry cited in [19] are situations or processes, such as rest-motion which may display a certain kind of Symmetry. Breaking of this Symmetry cannot happen without a cause, that is, no Asymmetry can arise spontaneously. This position, not unsurprisingly, is that of the anti-realist van Fraassen and it begs the question of the origin of any ‘first’ Symmetries and of their breaking. I see the existence of the Symmetry–Asymmetry pair as a further exemplification of the underlying duality of the universe.

5.5. A Question of Preference

In the discussion of the foundations of Symmetry, symmetric fundamental laws are preferred and Asymmetry, as it is created in real thermodynamic systems seem to get much less attention than Symmetry except as a negation. According to Lupasco, Symmetry has the properties of an identity and people like identities. This is an inevitable logical consequence of our existence as biological—read mortal—entities. We like identities—related logically to the running down of the universe according to the 2nd Law of Thermodynamics—since we ourselves instantiate the opposite, the emerging diversity of living beings. Similarly, Lupasco saw all 20th Century science as a search for invariants, to the exclusion of their opposites. This may be human but it is not good science. It is often said that the physical world appears asymmetric to us, but that that does not necessarily mean that Asymmetry belongs to the fundamental laws of nature. Perhaps, but it does not mean that Asymmetry may not, especially if it can be seen as operating dually with Symmetry. In this perspective, the discussion of the Symmetries in particles and Einsteinian space-time Symmetry become *a posteriori*. Once Symmetry is in hand so to speak, it can and must be broken for the universe to evolve.

5.6. Symmetry and Information in Complex Systems

I find the subject of Symmetry in relation to Information extremely interesting in principle. The mathematically knowledgeable authority on information, Mark Burgin, makes no reference to Symmetry in his major compendium, *Theory of Information* [20]. Other authors, for example Terrence Deacon [6], stress the Asymmetry of the thermodynamic changes involved in or which constitute information.

Today, does it make sense to talk about Symmetry principles applied to information and complex cognitive processes, such as a conference? I think not, basically because the concept adds no new information, no new laws in Luhn's terms, that are not already explicitly present or the consequence of the same emergent cognitive processes involved in other subjects. The cognitive process involved in my finding symmetrical patterns esthetic is not itself symmetrical, and if it is termed asymmetrical, then every process is asymmetrical and the term becomes vacuous. Use of the phrase "symmetrical behavior", similarly, would force Symmetry to have a purely semiotic meaning as a classification of the epistemological similarities between processes that has no further ontological purport.

What remains to be explored, I suggest, is the nature of the information present in complex systems that display both Symmetry and Anti-Symmetry. From this point of view, one may imagine that additional "non-classical" information is encoded as a consequence of the joint presence of entities whose form is congruent (the Yin-Yang picture) but whose reference is to an opposition between them as instantiating conflicting properties. This is another expression of the fundamentality of the dualist Principle of Dynamic Opposition in Logic in Reality. I wish to assure the reader, however, that nothing mystical intended here about the information that is encoded and decoded by the observer. The information in the encoding is present as a pattern of physical potentialities and its decoding results in a pattern of physical cognitive changes—"meaning-as-process".

5.7. Summary

Information and Symmetry/Anti-Symmetry are brothers-in-arms, "born" together with energy when our world became our world, but their relative roles have changed. Today, Information is hard at work, while Symmetry/Anti-Symmetry has retired to a somewhat more scientific and esthetic life. We now know that Symmetry must be taken into account in science, e.g., in any attempt to make meaningful statements about the emergent dynamics of our world at the fundamental level of quantum and non-quantum physics. Symmetry, or the absence of it in biological structures, is an important component of discussions on how they emerge, evolve and function.

The concept of Symmetry, which should be understood as Symmetry-Asymmetry and Symmetry/Anti-Symmetry, however, does support a scientific picture of the underlying duality of the universe, the fundamental principle underlying LIR.

Finally, as mentioned, I have shown elsewhere that the related Principle of Dynamic Opposition provides a non-transcendental grounding for ethics. The question, then, is how to best express the importance of Symmetry studies for the Information Society as well as Information Science. Given their difficulty, how can Symmetry principles contribute to the achievement of a new common informational good? It should be one of the collated goals of this document to be addressed.

6. Semiotics

To the extent that information, as energy transfer, is ubiquitous in nature, Information Science seemed to offer one kind of framework for its understanding. Another related perspective is that of Semiotics, defined as the further parsing of information into, or establishing its equivalence to, an interpreter-dependent theory of signs as carriers of meaning.

6.1. Semiotics and Information

From a theoretical standpoint, the fundamental properties of information might be expected to be closely related to those of signs. Semiotics, the study of signs as categorizing linguistic entities and processes in the representation of meaning, has a position intermediate between the philosophy and science of information. It therefore has a role to play as a system of classification which complements the general things about the universe that we learn from some scientific facts about it.

A new solution to the nature of information is being sought in the cybersemiotic approach of Sören Brier. The subtitle of his major book [21], *Cybersemiotics* is *Why information is not enough*. Why not? One answer is that information, while foundational, may only be a methodological pointer toward the presence in the world of complex dynamic cognitive phenomena, especially, knowledge (or knowing), human intelligence and semiotics, signs working to produce meaning in human and other living systems.

Brier argues for a transdisciplinary framework where signs, meaning and interpretation are the foundational concepts within which information concepts have to function, and that C. S. Peirce's concept of semiosis creates such a new paradigmatic transdisciplinary framework. This semiotic doctrine, however, can be criticized as giving a more central role to signs as representations of reality than to the dynamic properties of reality itself.

Standard semiotic theory is particularly concerned with explicating higher-order concepts such as meaning, sign use, representation, language, intersubjectivity, *etc.*, along with their interrelations. The standard Peircean definition of semiosis is that of a process of meaning making, of construing a material entity or phenomenon as a sign. In this acceptance, Semiotics is thus a theory of representation—it is things standing for other things, clearly to be distinguished from physical systems, which are termed “Dynamical Objects”. Peircean semiotics thus also provides an overview of knowledge from physical sciences to the complexities of human cognition and language.

Following Peirce, Sören Brier proposes that Semiotics is a necessary supplement to theories of information as such. Brier argues for a new transdisciplinary framework where signs, meaning and interpretation are the foundational concepts within which information concepts have to function, and that Peirce's phenomenological, pragmaticist and evolutionary concept of semiosis creates such a new paradigmatic transdisciplinary framework [22]. Cybersemiotics is his term for such a new non-reductionist framework. It integrates third person knowledge from the exact sciences and the life sciences with first person knowledge described as the qualities of feeling in humanities and second person intersubjective knowledge of the communicative interactions, partly linguistic, on which the social and cultural aspects of reality are based.

Some criticisms of this Semiotics have been addressed in the recent concept of Cognitive Semiotics developed by Jordan Zlatev [23]. Semiotic theory is particularly concerned with explicating higher-order

concepts such as meaning, sign use, representation, language, intersubjectivity, *etc.*, along with their interrelations. Bringing in empirical research as in Cognitive Semiotics can both contribute to their explication and, at the same time, produce new insights. Cognitive Semiotics is thus less directly dependent on any particular semiotic theory such as that of Peirce, and suggests that other kinds of Semiotics may also offer useful perspectives.

I have found no “non-Peircean” concept of semiosis that has been discussed in connection with information. To a certain extent, the doctrine of Marxist Semiotics, relevant to the societal implications of Information Science, is not Peircean in its not making explicit reference to the major Peircean categories. However, it does not seem to take into account physical scientific considerations which might support it.

6.2. *The Problem of Phenomenology*

The approach of focusing on the lived character of experience, based on the unique awareness of experience available to individuals, has led to the definition of the domain of phenomenology with which we are all familiar. Familiar however also, is Husserl’s later bracketing of the question of the existence of the natural world and its relation to experience.

As a semiotician, Brier has pointed out the weaknesses in much of standard philosophical and sociological thought in general and phenomenology in particular. He thus writes that Husserl, Heidegger, Merleau-Ponty and most recently Luhmann were unsuccessful in developing a proper philosophical framework for phenomenology, because they did not offer any adequately deep picture of things in themselves in relation to appearance. Like Wu, Brier states in [21] that Husserl’s transcendental idealism makes no contact with the world or the natural sciences.

Brier claims that the semiotics of Charles S. Peirce can deliver the missing philosophical framework through his semiotic understanding of the fundamental structure of the natural phenomena. Unfortunately, as I have discussed in [24], Peirce’s own framework is based on several assumptions about that structure derived ultimately from introspection. This leads him to ascribe a foundational role to chance and spontaneity as causal factors, without ontological commitment to any underlying physics of reality. His subsequent classification of real phenomena into “Firstness, Secondness and Thirdness” follows, but it remains just that, a system of classification of phenomena in terms of representation by symbols which adds nothing that helps us understand the ontological basis of the way the world evolves. That Peirce made an enormous contribution to logic is true, but on close inspection his logic, including his system of graphical representation, is an elaboration of standard linguistic, truth-functional logics that is still incapable of describing real phenomena without excluding their essential dynamic properties.

The advantage of a physical view of information such as that of LIR is that given the dialectical properties of energy, information-as-process describes the actual evolution of cognitive processes and information-as-concept serves as the unifying concept between the fields of physics, biology, neuroscience and mind. In this sense, a philosophy of information based on those properties is a more scientific and reasonable explanation of the mechanism of human understanding than phenomenology.

As a method involving a classical phenomenological suspension of natural objects and the human body, description of the mechanism of human understanding based on Peircean phenomenology is thus incomplete. We have no guarantee that his form of “bracketing” of energy in the discovery of meaning

does not beg the question of the dependence of meaning itself on an inclusive ontology that requires an ascent from physical dynamics, as in the work of Deacon [6] summarized in the next Section.

6.3. *Absence. Deacon*

If something stands for something else, that something else is not or is not fully present. This concept of absence is at the heart of the theory of information of Terrence Deacon. In this theory, Deacon shows how information as meaning can develop from a complex hierarchical dynamics in nature, and Deacon refers to Peircean Semiotics and its foundations as supporting his own theory. At least this one point, then, it is fair to say that a theory of Information Science and one picture of Semiotics intersect.

Apart from this case of agreement between the properties of information and signs, Semiotics and Information Science seem to me to be orthogonal. From my realist perspective, in principle, a Semiotics could be defined that assigns an appropriate role to signs in language and cognitive processes which is nonetheless based on an informational ontology, within Information Science. In such a theory, the central role would be given to the dynamic properties of reality itself rather than to signs as representations of reality.

One theory which, although coming from mathematics, offers movement toward reality is the semiotics of meaning as opposed to a semiotics of signs of the catastrophe theorist Jean Petitot. Petitot saw the evolution of meaning as a value-laden process involving interaction between biological structures and linguistic (narrative) entities. Like the theory of Deacon, that of Petitot involves an inversion of perspective that includes looking at the underlying (mathematical or topological) forms “behind” natural processes. The graphs of the different catastrophes describe the actual physical couplings between internal and external components-in-opposition of a given process.

6.4. *Hofkirchner and Peirce*

At the Conference on the Foundations of Information Science in Paris in 2005, Wolfgang Hofkirchner and his colleagues stated that in a Peircean semiotic approach, information is an interpreter-dependent objective process. But Hofkirchner was concerned that the existing scientific and technological perspective was reductionist and required integration of a humanistic perspective including subjective quality.

In his 2013 book [8], in extending his concept of information process and information structure, Hofkirchner also describes an oscillation between them which is reminiscent of LIR (“actualization of potential information by another subject”). He still feels that this description can be related to Peirce’s classification of relations between epistemic individuals. However, Hofkirchner suggests information is, also, a relation, a sign but primarily a “signans”, a signing, the gerund expressing better the concept of process.

Despite Hofkirchner’s statement that information is a relation, necessarily involving energy transfer but not a material entity or ideational event, he calls attention to a dialectics that “recognizes the identity and difference of matter and information”. The views of Peirce and Hofkirchner on the essential dialectic properties of signs in relation to information are by no means identical, and Hofkirchner does not exclude alternative ontologies from the debate.

I would like to assure readers familiar with the work of Peirce that I have not singled it out as some kind of “target” for criticism here, although I have done so elsewhere [24]. It is a fact that this work enjoys much prestige as having explanatory power for complex cognitive phenomena. The consequence

is that many of its tenets that conflict with other approaches tend to be accepted without debate. For example, as Petrov [25] has pointed out, in Peirce, the relation between physical reality and objective, sign reality is the same as that between his categories of Secondness (a binary relationship of opposition, impact, cause-and-effect) and Thirdness (a triadic structure in which one item relates to another for yet another, the last one being the “Interpretant” of the dynamic between the first two). The trick succeeds only because one has put the rabbit in the hat beforehand only to pull it out later. Secondness is already implicitly Thirdness, and the so-called physical relation is already implicitly objective.

There can never be a rigorous definition of what a “sign” is, since the only way to verify its rigor is by comparing the definition with the thing itself. If, as Peirce famously said, the universe might be “composed exclusively of signs”, the term becomes vacuous. The starting point of Petrov’s critique was the fact that global semiotics cannot behave as if the matter it deals with—signs—is something directly accessible in the manner of extant entities. It must first make signs discoverable. For this fundamental task, it needs a general theoretical framework that makes some kind of ontological commitment and one may question whether the Peirce’s epistemological categories can do the necessary work. According to Petrov, Umberto Eco [26] states this realization forcefully: “When semiotics posits such concepts as ‘sign’, it does not act like a science; it acts like a philosophy when it posits abstractions such as subject, good and evil, truth or revolution”.

6.5. Interim Conclusion

My interim conclusion from this brief comparative analysis of Semiotics in relation to Information Science is that a dialogue between the approaches has not yet been established. However, to the extent that philosophy and science are converging under the influence of the unique properties of information, reflected in Information Science, a convergence of the latter and Semiotics may also be possible.

I believe that Information Science is thus a potential “partner” of Semiotics. The primarily ontological concepts of Information Science and the epistemological concepts of Semiotics could be interpreted as capable of interacting with one another at a theoretical level. Understanding the relations between the two fields may also provide support of information as a commons.

7. Society

7.1. Introduction. Three Crossroads

The document on which this Section is based was written in direct response to the concept of the Vienna Conference of the Information Society being at a crossroads. The framework for this analysis was the major sub-conference on the impact of the Information and Communications Technologies on the society (ICT&S). I saw the “crossroads” as actually being constituted by three components, as follows:

- Socio-Political Crossroads

In the world today, trends toward improvement in the quality of life are offset by a regression and degradation of the mental and social environment, both in part due to the massive role of information in the society. As at any crossroads, one has the possibility of going forwards, sideways or backwards. It is necessary to understand the way information operates to get on the “right” road.

- Transdisciplinary Crossroads

The science and philosophy of information as disciplines are also at another, closely related crossroads: they may develop in the direction of integration in an Informational Turn, a new way of Informational Thinking as proposed by Wu Kun [27] that can support efforts toward a Global Sustainable Information Society, in the term of Wolfgang Hofkirchner [8]. Alternatively, they may diverge or regress in the direction of increasingly socially irresponsible specialization and scholasticism.

- Metaphysical Crossroads

A third crossroads, inseparable from the first two, involves the direction of development of the science and philosophy of information as metaphysics, a crossroads that includes a definition of the dynamic relation of man to the universe. Like the other two, there is a positive branch (“Turning One’s Head” as Gerhard Luhn describes it [28]) leading toward less dysfunction at the individual and social level. The negative branch implies an on-going blockage of ethical development of the society.

In this Section, I discuss three aspects of information as they relate to a potential information commons. One is the political dimension and the potential commitment to some form of action in which practitioners of information science could be involved. The second is my dialectic logic in reality Logic in Reality outlined in Section 4 that, in my view, best describes the nature and evolution of information; and the third is the relation of that logic to the dialectic logic of Hegel in some of its current interpretations, as discussed by Fuchs in 2006 [29]. In this view, Logic in Reality provides a link to science, hence its scientific support of initiatives for the common good. This paper is, accordingly, a response to the one question posed in the ICT&S, namely, “What contradictions, conflicts, ambiguities and dialectics shape the 21st century information society”?

7.2. *The Problem of Logic—Again and Still*

The current social, political and economic system, with its failures and lack of ethics is unfortunately supported, directly or indirectly, by the tenets of standard philosophy and in particular its logic. In many theories of society and economics, the underlying logic is essentially bivalent classical logic, a logic of “exclusion”, mirroring the absolute separation between premise and conclusion, set and member of set and the principle of exclusivity in standard category theory. The situation has scarcely evolved since 1936, when Norris stated [30] “...practical and technological problems simply cannot be solved by use of Aristotelian logic alone. This is not a logic of forward-looking or intentional activity whether practical or technological”.

For Jacques Ellul in the 1960s [31], the term logic characterized primarily the dysfunction of the society, as in “the implacable logic of the market” that exacerbates the separation between the global networks, for example in Manuel Castells’ conception [32], of capital flows and the human experience of disenfranchised workers. Barinaga and Ramfelt [33], quoting Castells, state that one of the challenges of the society is that its very logic is based on an idealized, one-sided conception of society that excludes an important part of the world population. Any intellectual approach that weakens, deconstructs or discredits this ideology and proposes workable, socially acceptable alternatives is therefore to be welcomed.

In [29], Christian Fuchs suggested the need for a new functional “logic of self-organization” as a necessary feature for models to be able to deal with normative aspects of development, so that the

“meaning” of the meaning of information is not ambiguous, but includes a moral dimension. At this Conference, a section on the Internet, Commodities and Capitalism will deal with the commodity logic of contemporary capitalism.

In a 2009 paper [34], I described further the essential components of my “logic of and in reality” (LIR), and showed that it had the capability of addressing and illuminating issues raised by Hofkirchner, Fuchs *et al.* in their evolutionary “Salzburg Approach”. LIR founds a logical approach to the evolution of both groups and individuals and their interaction, and to the negative as well as the positive aspects of current technological developments. LIR provides a new logical interpretation of key concepts in social theory including morality, cooperation and conflict, grounding them in physical reality and authorizing patterns of inference. The term “evolutionary” is discussed in terms of similarities and differences with biological evolution; LIR offers a logical explication and expansion of Fuchs’ statement that nature and society are both identical and non-identical.

The Relation to Hegel

Logic in Reality is both dialectical and transcendental in the sense of Hegel. It is dialectic in that the law of non-contradiction fails and transcendental in that it ‘straddles’ the opposition between subject and object [14]. Such a logic is close to an ontology, that is, it says something about the nature of things. Of course, the conceptual structure of reality that LIR offers includes information to which Hegel did not have access. None of it, however, is inconsistent with the principle of contrastive dialectics but rather reinforces it. As I have pointed out elsewhere, LIR supplements Hegel by adding a descending dialectic to Hegel’s ascending one and incorporates a necessary ground at the lowest physical level of reality. Logic in Reality makes it possible to enter the dialectic process from science itself, that is, the entities postulated and in part proven by science (other than to hard-core anti-realists), for example quantum physics, are compatible with a philosophical sublation and indeed isomorphous to it. Elements and their contradictions or oppositions follow the same pattern of evolution and emergence.

7.3. Žižek and Fuchs: A Fresh Look

The sociologist Slavoj Žižek is a devastating critic of the current late-capitalist politico-economic system and its “pseudo-natural logic”. Calling our society an Information Society is already an ideological statement, although not recognized as such, since it suggests degrees of freedom from capitalism that do not exist. In a major book, *Living in the End Times* [35], Žižek shows how this anti-humanist system is reflected in current art—literature and cinema—even in its “New Age” form supposedly opposed to the current capitalist paradigm. One must reject the ideology at work in technology and the artificial solutions it proposes. However, “It is not enough to demand an ecological reorganization of capitalism, but neither will a return to a pre-modern organic society and its holistic wisdom work”. Žižek thus calls for a “fresh look” at the uniqueness of our situation, a concrete social analysis of the economic, political and ideological roots of our problems. A reconceptualization of dialectical logic is necessary to which Logic in Reality may contribute.

In the paper prepared for this Summit referring to Žižek, Fuchs [36] states that capitalist society operates in such a way as to maintain the continuity of capitalism as a system in the face of contradictions resulting from the discontinuities which are a consequence of the ICTs. In Lupascian terms, “energy”

needs to be added to permit a resolution of these contradictions at higher level of reality, in other words, convert the ICTs to an information commons, a non-capitalist information society. Logic in Reality, in my view, should be the preferred language to discuss complex interrelated contradictions and dialectics of dialectics, a term used by Lupasco [14].

7.4. *What Has Happened to the Common Good?*

The environments for human existence which can be considered as components of the common good are the following: (1) the informational environment, defined by the revolution in the information and communications technologies (ICTs); (2) the natural global environment which, apart from some local improvements, is undergoing massive and possibly irreversible degradation; (3) the local socio-economic environment in which individual human beings evolve.

In a recent book [37], whose title is that of this section, François Flahault shows that social reciprocity and coexistence are the essential requirements for a satisfactory individual life, defining the real, non-economic “common good”. However, the necessary codification of the rights of individuals, in the Universal Declaration of Human Rights in the aftermath of World War II, is now interpreted in a context of market-driven globalization of the ICTs, leading to a drastic and inhuman devaluation of the common good. What is new and problematical in the environments is not technology—science and engineering *per se*—but the ever-increasing space, material and mental, that is abusively occupied by the artifacts of technologies and their misdirection to individual selfish goals. Unless philosophers and logicians as well as scientists address these issues, they will have failed to address the reality of our world.

7.5. *The Social Competence of Information Science. LIR*

What is thus missing in much of the information science literature is the social-political dimension, the social, economic and political context in which any application of a more ethical philosophy theory must be made. This paper may be thus considered as having aspects of a social critique, a “social philosophy” in the sense of the neo-Marxist Franck Fischbach [38]. I see the entire Summit as social philosophy in this sense. It is an ethical reflection on an informational commons as a necessity for that commons, and it is at the same time a political reflection on the process of struggle to achieve it. Fischbach’s social philosophy does not separate the social from the political, sparing the effort to put them back together subsequently.

The complex entity constituted by the participants in this Summit and their contributions confers a competence and a unique credibility on them. Practitioners of Information Science start with an advantage of being at the heart of the defining technology of our “Information Age”, and I suggest that this is recognized by every user of the technology, that is, everyone.

In the perspective outlined here, Logic in Reality is the thread that runs from the foundations of the nature of information in the physical structure of the world, through the informational characteristics of human beings to those of the society that defines the context for human existence as a social animal. LIR is therefore a new tool to use in the “struggle to learn how to struggle”. In the metaphilosophy of information of Wu Kun [39], informational activities have as a direct consequence the weakening of centralized governments and political institutions and, correspondingly, a strengthening of a commons.

7.6. Social Responsibility and the ICTs

The most appropriate source of concepts for a better use of information science and technology for the common good should be information scientists themselves. I am convinced that negative attitudes toward technology as such are to be avoided, like all absolutist doctrines. As the information scientist and philosopher Gordana Dodic-Crnkovic puts it [40], “the question is not how to get rid of technology but how to get better technology that promotes human values and a sustainable society”. The target for dialogue is, then, the technologist to demonstrate to him or her that present technology is not socially sustainable and that improvement in social sustainability is both desirable and possible. Necessarily, it will be the engineering community that must constructively contribute to the sustainable development of society by designing and constructing devices that will better reflect our cognitive, social, emotional and informational needs.

However, this is clearly only part of the answer. The process by which technology affects society and *vice versa* is never ending, but no single technical solution is final. Society as a living organism is in constant development, and the integration of any technical solution will lead to a change in the habits and behavior of society, for which the previous solution becomes inadequate. Society, to be considered here from the standpoint of these non-technical components, must be able to demonstrate the limitations of technical solutions suggest the need for non-technical ones and propose at least some reasonably rigorous conceptual framework for them as well. The prestige of information science suggests that it has the credibility to define necessarily transdisciplinary non-technical solutions and contexts that could be accepted by “technology”.

It is important, in such a discussion, to include and even focus on basic scientific concepts that have direct implications for the social value of technology. The ecologist Robert Ulanowicz has shown [41] that attempting to resolve society’s predicaments through the search for ever-increasing efficiency becomes equivocal in a world of limited resources in which entropy exists in two forms. Raising the efficiency of a given system beyond a critical point leads to catastrophes that tend only to restore the system to its original narrow range of operation.

7.7. Toward a New Democratic System

In the applications suggested by Wu Kun for his theory and philosophy of information [10], no specific comprehensive economic-political model is suggested, but he does call for a “new democratic system” that would permit maximization of the benefits from the new information technologies. It would include an informational perspective for studying social phenomena and provides a social information theory based on his concept of the essence of information in a social evolutionary context. The expanded role of social role of information is accompanied by the development of networks for its dissemination resulting in (slow) disappearance of centralized nation and global hegemony. In this process, information creation, processing and dissemination of the network approach becomes a technical prerequisite to building a new democratic society.

Human interests should be at the heart of any proposals for change in a society defined today by the evolution of its information processing modes in the scientific, economic and social domains. However, any theory or model of such changes cannot ignore (see my interpretation of the Lupasco logic) the

fundamental embodiment of contrary, anti-social and anti-civilizational forces in the society that make the “common struggle” for common good and implementation of the human values a struggle indeed. An “ideal” Information Society would require, Wu suggests, the emergence of a diversified, non-authoritarian network involving a modern form of the atrophy of centralized natural systems.

Wu thus sees the multi-dimensional informational structures and processes in the society as reducing domination by central governmental control. They thus support an increase in principle in democracy, including information as a commons. Further work is needed, however, to determine if there is a direct correlation between the operative principles of Wu’s Philosophy of Information and the political change necessary to implement them.

8. Conclusions and Outlooks

In this paper, I have presented three domains of knowledge and their relation to information and Information Science. I have gone from the foundations of information in physics to its relation to language and signs and to the role of information processes in society.

I have further suggested that the unique dualism of information has *ipso facto* major implications for science and philosophy as a new form of cognitive object that tends toward their mutual integration, discussed by Wu Kun a paper just published from the Vienna Summit [42]. In Wu’s conception, this perspective of the “scientification of philosophy” and the “philosophization of science” is not intended to eliminate the specificity of both disciplines, nor their individual development at a theoretical level, but requires the acceptance of the non-separability of certain kinds of science and philosophy. The consequence may be an improved understanding at the ethical and social level of a more logical approach, in the sense of relation to reality, to eventual resolution of on-going conflicts in the information society.

At the Vienna Summit, I also [43] argued for a major role for Transdisciplinarity in the acceptance of Basarab Nicolescu as another relevant framework for the understanding of information and information processes—that the major “future” of transdisciplinarity and transdisciplinary studies may be in the construction, together with information studies, of a new concepts and contexts for favoring the common good and the development of a Globally Sustainable Information Society. I feel that the inclusion of transdisciplinary and informational perspectives in scientific or philosophical work is not simply an intellectual exercise but a social and moral imperative.

I do not wish to imply that any combination of transdisciplinarity, Informational Philosophy and Logic in Reality automatically provides a way of solving individual and social problems. However, by calling attention to their common dynamic structure and pattern of evolution, it suggests an attitude of openness and tolerance. New ideas and solutions may emerge as the (actual and potential) interactive transdisciplinary relations and oppositions between different approaches are maintained in the forefront of discussion.

An urgent task, then, is to find new ways of correlating and organizing the insights of the corresponding different domains of information, directed not toward some impossible unity but to new functional forms of knowledge. The output of the Vienna Summit, as collated in this Special Issue, should be exemplary in combining method and content to begin to fulfill the promise of information.

Finally, encouraged by Fuchs’s demonstration at the Summit of the importance of Heraclitus’ version of dialectics, I close with a fragment that I feel is *à-propos* to a paper about an information commons:

“Fragment 2: Accordingly, one ought to follow what is common, that is to say, what is universal. For the universal Word is common to all...”

Acknowledgments

I would like to acknowledge my thanks to Wu Kun, Head of the International Center for the Philosophy of Information for the privilege of working with him and his associates. In particular, I found most stimulating our cooperation on the 2nd International Conference on the Philosophy of Information held in connection with the Vienna Summit.

Conflicts of Interest

The author declares no conflict of interest.

References

1. Brenner, J.E. *Logic in Reality*; Springer: Dordrecht, The Netherlands, 2008.
2. Wu, K. The Interaction and Convergence of the Philosophy and Science of Information. In Proceedings of the 2nd International Conference on the Philosophy of Information, Vienna, Austria, 3–7 June 2015.
3. Marijuan, P.C. The Uprising of the Informational: A New Way of Thinking in Information Science. In Proceedings of the 1st International Conference in China on the Philosophy of Information, Xi'an, China, 18–21 October 2013.
4. Del Moral, R.; González, M.; Navarro, J.; Marijuán, P.C. From genomics to scientomics: Expanding the bioinformation paradigm. *Information* **2011**, *2*, 651–671.
5. Brenner, J.E. The Logical Dynamics of Information; Deacon's "Incomplete Nature". *Information* **2012**, *3*, 676–714.
6. Deacon, T.W. *Incomplete Nature. How Mind Evolved from Matter*; W.W. Norton & Co.: New York, NY, USA, 2012.
7. Luhn, G. The Causal-Compositional Concept of Information Part I. Elementary Theory: From Decompositional Physics to Compositional Information. *Information* **2012**, *3*, 151–174.
8. Hofkirchner, W. *Emergent Information: A Unified Theory of Information Framework*; World Scientific: Singapore, Singapore, 2013.
9. Brenner, J.E. The Logic of the Physics of Information. *Information* **2014**, *5*, 389–403.
10. Wu, K. The Basic Theory of Philosophy of Information. In Proceedings of 4th International Conference on the Foundations of Information Science, Beijing, China, 21–24 August, 2010.
11. Floridi, L. *The Philosophy of Information*; Oxford University Press: Oxford, UK, 2010.
12. Wu, K. The Development of Philosophy and its Fundamental Turn. In Proceedings of the 1st International Conference in China on the Philosophy of Information, Xi'an, China, 18–21 October 2013.
13. Wu, K. The Interaction and Convergence of the Philosophy and Science of Information. In Proceedings of the 2nd International Conference on the Philosophy of Information, Vienna, Austria, 3–7 June 2015.

14. Lupasco, S. *Le Principe d'antagonisme et la Logique de l'énergie*; Editions du Rocher: Paris, France, 1987. (In French)
15. Darvas, G. The unreasonable effectiveness of symmetry in the sciences. *Symmetry Culture Sci.* **2015**, *26*, 39–82.
16. Rovelli, C. Relative Information at the Foundation of Physics. In *It From Bit or Bit From It?* Springer: Zurich, Switzerland, 2015.
17. Borsanyi, S.; Durr, S.; Fodor, Z.; Hoelbling, C.; Katz, S.D.; Krieg, S.; Lellouch, L.; Lippert, T.; Portelli, A.; Szabo, K.K.; *et al.* Ab initio calculation of the neutron-proton mass difference. *Science* **2015**, *347*, 1452–1455.
18. Penrose, R. *Cycles of Time*; Vintage Books: New York, NY, USA, 2010.
19. Brading, K.; Castellani, E. *Symmetry and Symmetry Breaking*, Spring 2013 ed.; The Stanford Encyclopedia of Philosophy: Stanford, CA, USA, 2013.
20. Burgin, M. *Theory of Information: Fundamentality, Diversity and Unification*; World Scientific: Singapore, Singapore, 2010.
21. Brier, S. *Cybersemiotics: Why Information is not Enough*; University of Toronto Press: Toronto, ON, Canada, 2008.
22. Brier, S. Cybersemiotics: A New Foundation for Transdisciplinary Theory of Information, Cognition, Meaningful Communication and the Interaction Between Nature and Culture. *Integral Rev.* **2013**, *9*, 220–263.
23. Zlatev, J. Cognitive Semiotics. An Emerging Field for the Transdisciplinary Study of Meaning. *Public J. Semiot.* **2012**, *4*, 2–24.
24. Brenner, J.E. On representation in information theory. *Information* **2011**, *2*, 560–578.
25. Petrov, P. Mixing signs and bones. John Deely's case for global semiosis. *Sign Syst. Stud.* **2013**, *41*, 404–423.
26. Eco, U. *Semiotics and the Philosophy of Language*; Macmillan Press: London, UK, 1984.
27. Wu, K.; Brenner, J.E. The Informational Stance: Logic and Metaphysics. Part II From Physics to Society. *Logic Log. Philos.* **2014**, *23*, 81–108.
28. Luhn, G.; Hüther, G. *Wende im Kopf*; Radebeul/Göttingen, Germany. Unpublished work, 2014.
29. Fuchs, C. The Dialectic of the Nature-Society System. *Triple C* **2006**, *4*, 1–39.
30. Norris, O.O. The Logic of Science and Technology. *Philos. Sci.* **1936**, *3*, 286–306.
31. Lovekin, D. Jacques Ellul and the Logic of Technology. *Man World* **1977**, *10*, 251–272.
32. Castells, M. *The Information Age: Economy, Society and Culture. Volume II the Power of Identity*; Blackwell Publishing: Malden/Oxford, UK, 2004.
33. Barinaga, E.; Ramfelt, L. Kista—The Two Sides of the Network Society. *Netw. Commun. Stud.* **2004**, *18*, 225–244.
34. Brenner, J.E. Prolegomenon to a Logic for the Informational Society. *Triple C* **2009**, *7*, 38–73.
35. Žižek, S. *Living in the End Times*; Verso: London, UK, 2011.
36. Fuchs, C. The Dialectic: Not just the Absolute Recoil, but the World's Living Fire that Extinguishes and Kindles Itself. Reflections on Slavoj Žižek's Version of Dialectical Philosophy in "Absolute Recoil: Towards a New Foundation of Dialectical Materialism". *Triple C* **2014**, *12*, 848–875.
37. Flahault, F. *Où est passé le Bien Commun?* Mille et Une Nuits: Paris, France, 2011. (In French)

38. Fischbach, F. *Manifeste pour une Philosophie Sociale*; Éditions La Découverte: Paris, France, 2009. (In French)
39. Brenner, J.E. Wu Kun and the Metaphilosophy of Information. *Inf. Theor. Appl.* **2010**, *18*, 103–128.
40. Dodig-Crnkovic, G.; Jägemar, G.M. Sustainable ICT with Ubiquitous Mobile Devices—Challenges and Opportunities. In Proceedings of the 37th International Conference on Software Engineering, Florence, Italy, 25 May 2015.
41. Ulanowicz, R.E. Increasing Entropy: Heat Death or Perpetual Harmonies? *Int. J. Des. Nat. Ecodyn.* **2009**, *4*, 83–96.
42. Wu, K. The Development of Philosophy and its Fundamental Informational Turn. *Information* **2015**, *6*, 693–703.
43. Brenner, J.E. Information Science, Transdisciplinarity and Logic. In Proceedings of the 2nd International Conference on the Philosophy of Information, Vienna, Austria, 3–7 June 2015.

© 2015 by the authors; licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).