# WU KUN AND THE METAPHILOSOPHY OF INFORMATION

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***Abstract:*** *At the 4th International Conference on the Foundations of Information Science in Beijing, August, 2010, Professor Wu Kun of the Xi'an Jiaotong University presented, for the first time in English, the results of some thirty years of research on the theory and philosophy of information. In particular, Wu's theory (Basic Theory of the Philosophy of Information; BTPI) focuses on the natural ontological properties of information, and their importance for a proper understanding of the function of information in society. When describing my recent extension of logic to real process systems (Logic in Reality; LIR), including information, at the same Conference, I noted that Wu's approach embodied many critical aspects of this logic, to which its normative principles apply.*

*In this paper, I provide a summary of the Wu Basic Theory that defines a Philosophy of Information as a Metaphilosophy. The latter is not directed toward the codification of such a metaphilosophy as yet another static discipline or body of knowledge. It is rather an attitude toward the positioning of information as encompassing a critical component of all disciplines, beyond the scientific content specific to them. The Metaphilosophy of Information, then, describes primarily an attitude or stance, which I have termed the Informational Stance, that requires attention to the informational aspects of complex processes as a methodological necessity, in a process that Wu calls Informational Thinking. The Informational Stance, in my view, is thus a philosophical stance that is most appropriate for, and above all not separated nor isolated from, the emerging science and philosophy of information itself, for which I show that Logic in Reality is the appropriate logic.*

*My major conclusion is that the BTPI of Wu, his new informational view of the need for unification of critical disciplines and their formulation as a metaphilosophy constitute a major contribution, as yet unrecognized outside China, to the General Theory of Information that is the subject of this Conference. The theories described in this paper may constitute part of a new transdisciplinary paradigm, in which information has a central role. Application of my interpretation of logic together with Wu's metaphilosophy of information could contribute to resolving critical outstanding issues in the field of information and provide further support for an ethical development of the emerging Information Society.*

***Keywords:*** *ethics; information; logic; metaphilosophy; process*

## INTRODUCTION

### The Basic Theory of Wu Kun

At the 4th International Conference on the Foundations of Information Science in Beijing, August, 2010, Professor Wu Kun of the Xi'an Jiaotong University presented, for the first time in English [Wu, 2010], the results of some thirty years of research on the theory and philosophy of information. In particular, Wu's theory (Basic Theory of the Philosophy of Information; BTPI) focuses on the phenomenological structural and functional properties of information, and the importance of a proper understanding of information for the emerging Information Society.

Perhaps even more importantly, Wu emphasized the concept of information as a basic category of philosophy, defining the central role of information and information science in all relevant disciplines such as ontology and

epistemology as well as in science. This is a metaphilosophical principle, since it has to do with the content of philosophy itself. Justification for Wu's calling his Philosophy of Information a Metaphilosophy, "a highest philosophy", to be distinguished from all others, is its unique and universal character, its new worldview, as an informational conception of history, society, values, knowledge, science and technology.

Wu sees the field of information science as a complex of the philosophy of information, general information theory and different sub-domains of practical application in all of which he has made contributions. The full assessment of Wu Kun's work and its implications for both philosophy and the philosophy and science of information must await its complete translation into English. Although it is clear that his work provides a major new perspective on the complex ontological properties of information, discussion of all these fields is not possible in this paper, and I will focus primarily on the "umbrella concept" of the Metaphilosophy of Information.

Support for the key phenomenological concepts developed by Wu has come from my recent extension of logic to real process systems (Logic in Reality; LIR), including information [Brenner, 2008]. I noted that Wu's approach embodied many critical aspects of this logic, to which its normative principles apply. I am grateful to Professor Wu for his valuable comments and additions to this paper.

**Outline of Paper**

I am convinced that the Philosophy of Information in Wu's conception is at the heart of a new informational paradigm or informational-ontological turn. In Section 1, I suggest a content for that paradigm, including the possibility of a general theory of information involving philosophy, logic and ontology that embodies a transdisciplinary perspective. Section 2 compares my approach with other recent approaches to information as further indication of the unavoidable complexity of any even partially satisfactory definition. Section 3 returns to the specifically metaphilosophical concepts of Wu as essential to understanding the dynamics of the social and ethical dimensions of information.

Regarding methodology, the reader will see that I have not always maintained a clear distinction between a theory, logic and philosophy of information, while at the same time trying to avoid conflating them. I believe that in fact, as one consequence of the principles of Logic in Reality, such disciplines are not totally separated or separable, and their overlap or epistemic interaction is more significant than their differences. Indeed, one of Wu's proposals is for using information science as a basis for a Unified Information Theory that could lead to a unity of knowledge.

## 1 THE CONTENT OF A NEW PARADIGM

### 1.1 Progress in Philosophy and Logic

The major focus of a Conference to be held soon after this one[1] will be the kind of philosophy and logic that is appropriate for new technology, in particular, the new Information and Communication Technologies (ICTs). Luciano Floridi has stated [Floridi, 2010] that the ICTs have achieved the status of the characteristic technology of our time: the computer and its related devices constitute a "culturally defining technology". Information and

[1] 12th Conference on the Logic, Methodology and Philosophy of Science, Nancy, France, July, 2011.

Communications Systems (ICSs) and ICT applications are among the most strategic factors governing science, the life of society and its future directions of development.

Progress in science and technology is thus accepted as real, but the nature of progress in philosophy, if any, is unclear. New logics continue to be proposed, but on close inspection they all follow a standard propositional, truth-functional form, without the ability to describe complex processes and phenomena such as information without substantial reduction of its essential properties.

On the other hand, as Floridi and Rafael Capurro [Capurro, 2008] have shown, the availability of the ICTs has increased the coupling between social and political processes and the underlying philosophical paradigm. A responsible philosophy of information thus becomes an essential component for the elaboration of morally responsible public policy.

The Basic Theory of the Philosophy of Information (BTPI) presented by Wu Kun focuses not only on the phenomenological structural and functional properties of information, but the importance of a proper understanding of it exactly as the basis for movement to a more democratic society. I may consider that the body of Wu's work in information constitutes progress in philosophy, as does that of the other authors referred to below.

As I showed elsewhere [Brenner, 2010], however a satisfactory Philosophy of Information also requires an appropriate logic, and logics applicable to the new informational-technological context are simply not available. [Franssen *et al.*, 2010] summarize the Philosophy of Technology but say nothing about a logic of technology. Ellul [Lovekin, 1977] saw the "logic of technology" as a "closed, viciously idealistic" reductive form of thought that required humanization by the inclusion of non-identities. Further, Capurro states [Capurro,1996] that technology is "non-neutral", and standard logics are virtually required to be topic-neutral and context-independent.

As a first step, Floridi's development [Floridi, 2006] of a *logic* of and for information (Information Logic; The Logic of Being Informed) filled a major gap in the effort to characterize information, since standard epistemic and doxastic logics fail to capture its essential characteristics. The new Logic in Reality (LIR) proposed by Brenner is a new, non-propositional kind of logic that extends the domain of logic to real processes. Applied to the remaining open problems in information to which Floridi has called attention [Floridi, 2004], it constitutes an even more radical change in a logical approach for their solution. On overview of the key principles of LIR is provided below in Section 1.3.

### 1.2 The Basic Theory of Wu Kun

#### 1.2.1 The Existential Field

The basic insight of Wu Kun's Philosophy of Information is that the concept of objective reality = objective existence is too poor to describe the informational world. A proper new ontology and worldview is needed to describe the phenomenological characteristics of that existence. The approach of Wu to information is to start with existence as so constituted as objective and subjective from a phenomenological standpoint. He then places the critical terms of existence, objective and subjective, reality and unreality, and direct and indirect in a framework or partition diagram in which each combination of terms defines a path leading to matter-energy on the one hand and information on the other. Restating his key conclusions, information then has the following characteristics:

- Information has an indirect existence that is both objective and subjective.
- Subjective indirect existence is derived from subjective unreality that is part of subjective existence (human individuality).
- Objective indirect existence derives from objective unreality that is nevertheless part of objective existence.

Existence is constituted in this picture, then, by *both* matter-energy and information from a physical perspective. I thus conclude the essence of information, namely that it is "tied" to existence and reality through its objective and subjective aspects. It *is* those aspects. Hence all entities are characterized as dualities of matter-energy and information. The complexification that occurs in moving from one informational form to the next is readily interpreted in terms of grades or levels. The concept of information as indirect but still material existence enables Wu to show that any object is constituted by its directly and indirectly existing parts, material and its history, present structure and future structure which taken together constitute an informational entity or in Wu's term an "informosome" (see Section 2.1.1 below). This descriptive resegmentation of the field of existence (the extant domain) of Wu, when applied to informational processes or 'activities' benefits from the principles of LIR that further explicate their normative and qualitative properties.

### 1.2.2 The Classification and Structure of Information

Wu then classifies information into three independent forms and one dependent form:

- In-itself information

  In-itself information has an objective indirect existence not mediated by any subject. It is constituted by the basic particles of matter-energy and their fluctuations, which in turn constitute the Informational Field (IF). The IF has a direct existence and an indirect existential unity. The interactions taking place in the IF involve all entities in processes of information transmission and reception. In-itself informational activities are the most fundamental from which all others are derived. It includes, but is not limited to, information a well-formed, meaningful data in the view of Floridi.

- For-itself information

  For-itself information is the consequence of the grasp and processing of in-itself information by a subject with the necessary mental-psychological capacities, giving it subjective indirect existence. Wu designates this subject as the "informational subject".

These two categories recall Sartre's division of being into the categories of in-itself (*en-soi*) and for-itself (*pour-soi*). I cannot pursue further here the complex origins and roles of these categories, except to say that they offer a way of talking about existence that is compatible with a concept of intrinsic information and of its processing.

- Regenerated information

  Regenerated information is the consequence of creative informational activities operating on for-itself information by the informational subject resulting in higher-level concepts, images, symbols, *etc.* The complex of all such information in the individual is what is usually referred to as "mind" or spirit, whose existence is also subjective and indirect.

- Social information

  Social information is a dependent form of information constituted by the triple of in-itself, for-itself and regenerated information, in which the second two, involving information creation and processing by humans, are the most important. Social information undergoes its own process of "evolutionary" development.

### 1.2.2 The Informational Field

Wu's concept of an informational field further defines the essence of information. The field is multidimensional, including the various functions, roles, structures and relationships involved in the production, transmission and reception of information. From the standpoint of LIR, all of these entities, especially structures, must be looked at as causally effective processes. Lupasco used the term structuration, "*structuration*" in French, to emphasize the dynamic *process* aspects of complex structures, biological, cognitive or social. The answer he gave to his own question "*What is a structure?*" [Lupasco, 1967] was that structures are also dynamisms, not to be objectified and reified. In the LIR perspective, structuration is a real operation on the relations between two individuals. Any individual structure is never rigorously actual, that is, absolute in any sense, given the nature and logic of energy. It is a dynamic "structuring" that is always functionally associated with an antagonistic and contradictory potential structuring. Another way of saying this is that a structuring seen externally is a kind of form; looked at internally, it consists of the processes themselves.

In the remainder of this paper, I will continue on the basis that the principles of LIR in fact support to the descriptive resegmentation of the field of existence (the extant domain) by Wu. LIR makes it "logical" to talk about interactive relations between objective and subjective, reality and unreality, internal and external, direct and indirect and so on, and it does not exclude *a priori* the existence of real contradictions. LIR formalizes and explicates the absence of separation noted by Wu, retaining the consequences for information. For LIR, its "unreality" is only apparent since all information – as sent or received – is the effect of some real causal process. When applied to informational processes or 'activities', it aids in the explication of their active non-quantitative and normative properties and the evolution of the latter in their transmission, reception and interpretation.

As indicated in Section 1.3 below, LIR basically defines information as a process as the reality in a physical space of a dialectical relation between sender and receiver, in which meaning and value emerge due to the constraints on the evolving interactions [Brenner, 2009]. The conception of information-as-process is central to both the BTPI and LIR views. As stated by Quieroz [Quieroz *et al.*, 2008], the processual approach to information departs from the treatment of information as contained in some (static) structure, and moves toward an understanding of information as a semiotic process, a Peircean semiosis. In the next Section on current topics in information, however, among other things, I will return to the problems associated with the semiotic approach.

## 1.3 Logic in Reality and Information-as-Process

Logic in Reality (LIR) is a new, non-propositional kind of logic that extends the domain of logic to real processes. LIR is grounded in a particle/field view of the universe, and its axioms and rules provide a framework for analyzing and making inferences about complex real world entities and interactive processes at biological, cognitive and social levels of reality or complexity.

The term Logic in Reality (LIR) is intended to imply both 1) that the principle of change according to which reality operates is a *logic* embedded in it, *the* logic in reality; and 2) that what logic really *is* or should be involves this same real physical-metaphysical but also logical principle. The major components of this logic are the following:

- The foundation in the physical and metaphysical dualities of nature
- Its axioms and calculus intended to reflect real change
- The categorial structure of its related ontology
- A two-level framework of relational analysis

Details of LIR are provided in [Brenner, 2008]. Stated rapidly, its most important concepts are that 1) every real complex process is accompanied, logically and functionally, by its opposite or contradiction (Principle of Dynamic Opposition; PDO), but only in the sense that when one element is (predominantly) present or actualized, the other is (predominantly) absent or potentialized, alternately and reciprocally, without either ever going to zero; and 2) the emergence of a new entity at a higher level of reality or complexity can take place at the point of equilibrium or maximum interaction between the two.

LIR should be seen as a logic applying to processes, in a process-ontological view of reality [Seibt, 2009], to trends and tendencies, rather than to 'objects' or the steps in a state-transition picture of change. Processes are described formally as transfinite chains of chains of chains, etc. of alternating actualizations and potentializations of implications, considered with the other logical operators, conjunction and disjunction as real processes themselves. The directions of change are either 1) toward stable macrophysical objects and simple situations, the result of processes of processes, etc. going in the direction of a "non-contradictory" identity or diversity: or 2) toward a state of maximum contradiction (T-state for included third term) from which new entities can emerge. LIR is, therefore, a logic of emergence, a new non-propositional, non-truth-functional logic of change.

Standard logic underlies, rather, the construction of simplified models which fail to capture the essential dynamics of biological and cognitive processes, such as reasoning [Magnani, 2002]. LIR does not replace classical binary or multi-valued logics but reduces to them for simple systems and situations. The interactive relationships within or between levels of reality to which LIR applies are characteristic of entities with some form of internal representation, biological or cognitive.

In contrast to standard logics, LIR has no difficulty in accepting inconsistency, interpreting it as a natural consequence of the underlying oppositions in physical reality. Many if not most of the problems in the (endless) debate about the nature of change, as pointed out by Mortensen [Mortensen, 2008], seem to require a fundamental inconsistency in the world, which LIR naturalizes. Logic in Reality, then, is an information system that is not "brittle, like a classical logic system" [Floridi, 2010] in the presence of an inconsistency. Inconsistency is in the former is not only not as destructive as in the latter, but is accepted as an essential part of its ontology.

### 1.3.1 Information in LIR

Logic in Reality does not pretend to offer or to constitute an independent theory of information that would supersede any or all existing approaches. LIR provides a new interpretation of the concept of qualitative information or information-as-process [Brenner, 2010] as contrasted with quantitative information. Given its contradictorial approach to all complex real phenomena, LIR can be seen as a method, a logical methodology

that would encourage the retention and use of partially conflicting notions and theories of information, among others.

Among the key open problems in the philosophy of information, Floridi [Floridi, 2004] includes several concerning the relation between information and the actual world. Thus, information can be viewed from three perspectives: information *as* reality (e.g. as patterns of physical signals, which are neither true nor false), also known as *environmental* information; information *about* reality (semantic information, alethically qualifiable); and information *for* reality (instructions, like genetic information, algorithms, orders, or recipes).

Many extensionalist approaches to the definition of information *as* reality or *about* reality provide different starting points for answering the question of what information *is*, but the broad theory of information proposed by Wu requires an understanding of the properties and role of information at all levels of reality, in all entities. Whatever contributes to this understanding must accordingly be valuable for philosophy in general, and I propose this paper as a clarification of the relevant *ontological* properties of information.

The definition of information that is most congenial to LIR was made by Kolmogorov [Mindell, Gerovitch 2003] to the effect that information is any operator which changes the distribution of probabilities in a given set of events. This is quite different from his well-known contribution to algorithmic information theory, but fits the process conceptions of LIR. In LIR, logical elements of real processes resemble (non-Kolmogorovian) probabilities, and the logical operators are also processes, such that a predominantly actualized positive implication, for example, is always accompanied by a predominantly potentialized negative implication. It is possible to analyze both information and meaning (higher level information [Brenner 2010a]) as having the potential or being a mechanism to change the informational context.

LIR thus can provide bridging concepts or 'glue' between a concept of semantic information at the lowest data level and the broader applications. LIR places this concept, and thus the "superconcept" [Hofkirchner, 2009] of information, in a naturalized physical, metaphysical and logical context. Information is both a means to model the world and part of the world that is modeled, and LIR describes the dialectic relation between them.

### 1.3.2 Logic in Reality as Metalogic

Logic in Reality, as should be clear by now, is a new way of 'doing logic' that is much more radical than a change in the established object-process-property terminology. This is a metalogical consideration, since it discusses the logic of a logical system and the major components of that system, its rules and relations.

The metalogical properties of LIR are based on a view of nature that does not consider fundamental either to the abstract entities of pure classical propositional or mathematical logic or the anthropomorphic ontological concepts of phenomenology. The most fundamental metalogical principle of LIR is that of opposition or antagonism, without which, in this view, nothing could exist. This is, therefore, at the same time the most fundamental metaphysical principle of LIR. Nothing exists independently of something else in the formal ontology of LIR.

### 1.4 The Transdisciplinary Hermeneutics of Information Science

As I among many others have noted, the understanding of information requires knowledge in a multitude of different disciplines, and one way of bringing some order into this complex system is to introduce the concept of transdisciplinarity. Transdisciplinarity, in the universal definition of Nicolescu [Nicolescu, 2002], head of the International Center for Transdisciplinary Research in Paris, concerns that which is at the same time between, across and beyond all disciplines, the things they have in common. Its objective is the comprehension of the current world, of which one of the imperative necessities is a unity of knowledge. It is a theory that places the human being at the center of its preoccupations, and, in my opinion, has greater generality and is the one more suitable to discussing issues in education, ethics and other aspects of social theory than more pragmatic, "problem-solving" conceptions.

The three conceptual "pillars" of transdisciplinarity in the Nicolescu acceptation are 1) levels of reality; 2) complexity; and 3); a logic of the *included* middle, from which LIR has been derived. The key relation between disciplinarity and transdisciplinarity is that disciplinary research tends to involve just one level of reality, while transdisciplinarity is concerned with the dynamics resulting from the interaction of several levels of reality or complexity at the same time. A good model is in the work of the sociologist, biologist and philosopher Loet Leydesdorff on the interactions between the economic, political and knowledge-based sub-systems of society [Leydesdorff, 2006] in his theory of the Knowledge-Based Economy.

Logic in Reality, as discussed, is a logic of transdisciplinarity in the acceptation of the Paris Group. It is therefore a natural candidate as an additional tool for research in information. The unique function of this logic and its ontology would be to establish the structure of the relationships between competing theories and disciplines and thereby bridge the gap between them. In this "logic of transdisciplines", disciplines such as humanities and social sciences are not conflated in a differentiated unity but are dynamically connected epistemologically, changing one another and giving the opportunity for the emergence of new concepts.

The distinctions made by Hofkirchner et al. between multidisciplinarity, interdisciplinarity and transdisciplinarity are fully consistent with LIR, and are in fact essentially the same as those laid out by Nicolescu in his *Manifesto* [Nicolescu, 2002].

In the Charter of Transdisciplinarity which was promulgated at the 1st International Congress on Transdisciplinarity held in Arrabida, Portugal in 1994. Article VII states that transdisciplinarity is not a new discipline, nor a new religion, new philosophy, new metaphysics nor a new science of sciences. It can be considered as a process, a logical framework, a logic of human experience, a rigorous way of thinking about the relations and implications between events and people's actions, a language and an approach. The deontology of transdisciplinarity is based on the inalienable rights of the inner person in the context of the irreducible scientific and cultural novelties of today's world. Transdisciplinarity is a coherent terrain in which effective political will can be transformed by and into poetical or artistic will, a true politics of civilization, a civilized politics.

Wu Kun had, of course, anticipated this development in the sense that his Philosophy of Information established the central role of information in all disciplines. Thus information is itself something transdisciplinary that lies within, between and beyond disciplines and is common to all of them. He describes his research over a period of many years as broadly related to the following: the nature of the philosophy of information; information ontology; informational epistemology; an informational theory of evolution; social information theory; information value theory; an informational theory of thinking (see below Section 3.3); information and self-organization and

complexity theory; information and virtual reality; and systems of information science, the whole constituting a new scientific paradigm and a basis for future trends. In fact, it is an essential consequence of my approach that some of the distinctions that have been made between these terms serve only to block their overlap and mutual reinforcement. If this result can be seen in relation to information, it may have further consequences for individual disciplines as well, in particular, in emphasizing their relevant properties for social progress.

I therefore conclude that *no* approach to information, other than at the lowest level of data, Shannon-Weaver information in which meaning is not (yet) present, can be made without recourse to a transdisciplinary methodology in which the complexity and different levels of reality addressed by the disciplines co-exist and interact in a system of which the logic is Logic in Reality. In the transdisciplinary interpretations of such interactions, I see the beginnings of the operation of a new informational paradigm that both leads to and is constituted by what I describe below as a Metaphilosophy of Information and the Informational Stance derived from Wu's research.

## 2 CURRENT TOPICS IN INFORMATION

### 2.1 The Philosophy of Information

As Wu himself remarked, Luciano Floridi must be considered one of the founders of the field of the Philosophy of Information, independently of Wu himself. Floridi's studies were crystallized recently in his *Philosophy of Information*, [Floridi, 2010], and their relation to Logic in Reality developed in my two papers indicated above [Brenner 2010, 2010a] The original motivation for the development of a Philosophy of Information (PI) by Floridi was in response to a broader perceived need to place the entire field of information and its technology on a sound intellectual basis, as captured in Floridi's definition: "The philosophy of information (PI) is the philosophical field concerned with (a) the critical investigation of the conceptual nature and basic principles of information, including its dynamics, utilisation and sciences, and (b) the elaboration and application of information-theoretic and computational methodologies to philosophical problems.

In the LIR approach to information, a firm distinction cannot be maintained between the various extensionalist approaches to the definition of information *as* reality or *about* reality: probabilistic, modal, systemic, inferential (epistemic) and semantic. (For details see [Floridi, 2010]). The semantic approach defines information in terms of data space: semantic information is well-formed, meaningful and truthful data, information at the lowest ontological level. LIR provides the basis for saying that there is no absolute disjunction between this level of reality and those to which the more complex concepts of information apply. Many proposals of ways to unify these concepts have been made, *e.g.*, the recent one of Hofkirchner [Hofkirchner, 2009]. His approach to a Unified Theory of Information (UTI) is to eliminate the absolute and in my view artificial separation between critical concepts of information in favor of a dialectical relationship similar to the ancient intuition of 'unity-in-diversity'. Specifically, his "UTI seeks a concrete-universal concept of information rather than an abstract one".

Logic in Reality provides three *new elements* in relation to these points:

- a physical and logical grounding for a dialectical approach to information that explicates the concept of 'unity-in-diversity';
- a basis for a real, dialectical interaction between levels of abstraction, such that information at any level shares *some* of the properties to *some* extent of the structure of the information at the levels above and below it;
- a focus on information that is complex and value-laden which, unlike simpler data, is not easily decoupled from its support.

LIR can provide bridging concepts or 'glue' between the concept of semantic information that Floridi carefully and completely defines at the lowest informational level and the broader applications that he looks forward to. It is not a new concept that higher LoAs subsume aspects of semantic information. What LIR does is to place this concept, and thus the "superconcept" of information in a naturalized physical, metaphysical and logical context. Information is thus both a means to model the world and part of the world that is modeled and LIR describes the relation between them.

Comparing this view with that of Wu Kun, we see that in his Section on Complexity and the Program of Information Science, Wu calls for a research program that takes into account both the relative independence and mutual dependence of the elements of information systems, that is, all systems. As does LIR, Wu insists on the need for the *dialectic integration* of antagonistic relations such as those between reductionism and holism, determinism and non- or indeterminism, internal and external feedback, parts of networks and wholes, finally matter-energy and information. Where I and Wu differ is perhaps only in the emphasis to be assigned to the degree of reality or appearance of internal and external randomness and their interaction. As Wu states, however, it is ultimately the multi-level complex information feedback loops between a system and the environment at the thermodynamic level that determine its stability or survival.

### 2.1.1 Double Evolution of Information. The "Informosome"

The important conclusion for a theory and philosophy of information is derived from the concept, expressed in the Principle of Dynamic Opposition (PDO), that future evolutionary paths are available in the residual potentialities of the material elements and that all entities are a unity of actuality and potentiality (LIR) or direct and indirect existence (BTPI). LIR grounds the non-total separability of internal and external properties and their complex interactions, and the totality of their evolutionary movements are, in my view what constitutes information. Depending on the level of reality involved, the information will include varying proportions of the kinds previously defined (Section 3.2) (in-itself, for-itself and social). Wu has designated this complex as an "informosome". This term is currently in use in biology [Allaby, 1998] to refer to mechanisms of protein transfer in the cell, but this process should indeed be understood as informational in the broad sense of this paper. This is a further consequence of my view that both material processes and their informational components evolve together. (The neologism of "informosome" is similar to the new term "exposome", also from the field of biology [Lopes and Silk, 2010]. The term exposome refers to the totality of environmental exposures of an individual from conception onwards, and has been proposed to be a critical entity for disease etiology. I note that, interestingly, that like the informosome, the exposome is constituted by a totality of *information*. It *is* an informosome.)

It is a basic principle of the interaction between subject and object, in their standard definition as different entities, that there is no direct contact between them at all times or any times. Logic in Reality postulates that, for example in the case of two people, they are *not totally* separate, but that each has internalized and thus shares part of the other's mentality or personality. Such a process, as Wu correctly points out, must have taken place *via* a series of intermediate steps ("intermediaries"), each of which should be considered from an informational standpoint, as an informational process. This concept characterizes the general processes of human cognitive activities as informational activities.

### 2.2 Semiotic Approaches

The difficulties of providing a principled description of the obvious non-physical properties of information has tended to favor approaches based on the extremely comprehensive categorial view of the world proposed by C. S. Peirce. Semiotic approaches are popular because they provide a way of discussing the intangible properties that seem to accompany the transfer of information and meaning.

At first sight, the semiotic approach to information might appear to capture its multiple facets, ordering them into the functional categories proposed by C. S. Peirce. Brier has provided a complete current interpretation of Peirce in relation to information in his *Cybersemiotics* [Brier, 2008]. However, I consider Peirce's theory insufficiently dynamic because there is no energy that can be assigned to his triadic relations that would give them a basis in reality (physics). I see the same problem with Peirce's categories as with the Hegelian triad of thesis, antithesis and synthesis: there is no deductive basis for the movement from one term to the other or a description of any physical interaction between them. If the argument is made that nothing of the sort is required, my response is that is exactly the problem – the terms are not physically grounded and hence have limited explanatory value other than as a heuristic device for keeping track of the entities involved in biological processes; its use should not make one neglect the real properties of the system.

The Peircean semiotic concept of information has been summarized by [Quieroz *et al.*, 2008] (QEE) as a "triadic dependent" process where a form is communicated from an Object to an Interpretant through the mediation of a Sign. My critique of this approach is that as stated by Peirce himself, it is derived from a *formal* science of signs that provides an *analytical* framework. Thus the QEE approach to information as process is constrained by the abstract characteristics of the Peircean categories, that is, their abstraction from dynamic aspects of real physical phenomena.

In contrast to QEE, I derive the triadic characteristics of information from the LIR view of the contradictorial evolution of all real processes, providing the physical basis for the QEE differentiation of potential and effective (actual) semiosis and consequent definition of potential and effective *information* as well. In LIR, information is a complex of processual interactions with both binary (dyadic) and ternary (triadic) properties, all of which can be predominantly actualized (effective) or potentialized (not effective) at any time. This would seem preferable to the nebulous concept of a Sign as a Medium for communication of Form.

The essentially static linguistic definition of Form in terms of "conditional propositions" states that certain things would happen under certain circumstances. Strikingly, as quoted by QEE, Peirce said that "*Form can also be defined as potentiality ('real potential': EP 2.388)* (emphasis mine). In LIR, structure and form are also physical processes, including the physical processes of their conceptualizations. Form is characterized not as 'potential' only, but as a process whose elements are both actual and potential at the same time.

In summary, in my view, semiotic approaches to information have gone to an anti-realist, epistemological extreme, ignoring relevant physical characteristics of information that are implied in Wu's discussion of the relation of energy and information. One of the major points of concurrence between the BTPI and LIR, as first seen at the 2010 Beijing Conference are in fact the central position given to energy in its actual and potential aspects. In fact, it is not surprising, in Wu's realistic ontological and interactive approach to information, the *absence* of references to semiotics.

There is, the above notwithstanding, a convergence of intention between Wu and Brier in that both work toward creation of a broad philosophy of information and cognitive and communication science in which different

approaches can be seen not as mutually exclusive, but rather as mutually complementary in accepting an ontology where reality does have structures and processes. I note that Brier, as do Wu and I also calls attention to the transdisciplinary character of information and communication science. LIR extends the foundations of information processes, like other physical phenomena, however, back to physics and provides a basis for discussion of the contradictorial patterns of evolutions of complex entities, without recourse to Peircean speculative categories.

The basis is in hand, therefore, for a new form of theory of information in which epistemological and semiotic considerations are supplemented by the natural ontological concepts of Wu, as well as by the causal-operational concepts of Burgin discussed below (see Section 2.4).

### 2.3 Unified Information Theory

Recognition of the problems of classes of prior theories of information has been well summarized by Hofkirchner, most recently in his analysis of the requirements of a potential Unified Information Theory (UIT). I see in this work an important emphasis on the importance of a proper hermeneutic process rather than on some chimerical "final and complete" theory.

#### 2.3.1 Toward a Unified Theory of Information

I note first that the scheme of principled distinctions proposed by Wu has a relationship to and a place in the conceptual approaches that Hofkirchner has recently listed to a Unified Theory of Information (UTI). Hofkirchner [Hofkirchner, 2009] among others has argued for the desirability of a UTI that would encompass the different manifestations of information processes. Such a UTI should be capable of balancing the apparently contradictory properties of information - physical and non-physical, universal and particular - without reduction. Its underlying principle should be "as abstract as necessary but as concrete as possible at the same time." Hofkirchner considers information as a "superconcept", which includes a group of overlapping concepts such as message, signal, *etc*. as they apply to communication, cognition and cooperation between human and non-human organisms. Hofkirchner asks how matter and idea, mind, information, *etc*. can be grasped as complements and with them information as a thing (a structure, a flow) or as a human construction. Hofkirchner gives a dialectical answer to the implied division between subject and object, suggesting that mind, and with it information, is of a different 'materiality' than 'non-emergent' states of matter.

His own approach to a Unified Theory of Information (UTI) is to eliminate the absolute and in my view artificial separation between critical concepts of information in favor of a dialectical relationship similar to the ancient intuition of 'unity-in-diversity'. Specifically, his "UTI seeks a concrete-universal concept of information rather than an abstract one". Hofkirchner wishes to avoid reliance on a "formal-logical figure of necessary and sufficient conditions" and use a way of thinking that integrates as well as differentiates the particular and universal", with which LIR agrees.

From the LIR standpoint, mind and information can be seen as "complements" if one sees them as processes. Structure, flow and "human processing activity" all follow the same real, physical dialectics. If matter and information are differentiated in a "common genus", for LIR*, that genus is simply energy, and both follow its logical patterns of evolution*, avoiding the problems of the term "different materiality". Logic in Reality is, also, a

logic of emergence or "emergent materialism". In this view, information is, *pace* Wiener, an energetic phenomenon that instantiates real contradictions.

Both Wu and I consider that the "opposites" or contradictions in information are not captured by the classical concept of a classical, static "unity of opposites", but by the dialectical interaction of the opposites as classified above. The Wu classification is thus the critical *first step* in the characterization of the complex phenomenon of information.

Hofkirchner's approach to a Unified Theory of Information (UTI) is to eliminate the absolute and in my view artificial separation between critical concepts of information in favor of a dialectical relationship similar to the ancient intuition of 'unity-in-diversity'. Specifically, his "UTI seeks a concrete-universal concept of information rather than an abstract one".

Hofkirchner's information "superconcept" includes a group of overlapping concepts such as message, signal, *etc*. as they apply to communication, cognition and cooperation between human and non-human organisms. Hofkirchner asks how matter and idea, mind, information, *etc*. can be grasped as complements and with them information as a thing (a structure, a flow) or as a human construction. Hofkirchner gives a dialectical answer to the implied division between subject and object, suggesting that mind, and with it information, is of a different 'materiality' than 'non-emergent' states of matter.

From the standpoint of both the BTPI and LIR, mind and information can be seen as "complements" if ones sees them as processes. Structure, flow and "human processing activity" all follow the same real, physical dialectics. If matter and information are differentiated in a "common genus", for LIR*, that genus is simply energy, and both follow its logical patterns of evolution*, avoiding the problems of the term "different materiality". Logic in Reality is, also, a logic of emergence or "emergent materialism". In this view, information is, *pace* Wiener, an energetic phenomenon that instantiates real contradictions.

Hofkirchner's UIT is, appropriately, itself very much work-in-progress, and is in fact the title of a research project at his Institute. Nevertheless, its focus as a necessity for the development of an ethics for the emerging Information Society [Brenner, 2009] brings it close in spirit to the work of Wu.

### 2.4 Information as a Natural and Social Operator

The approach of Mark Burgin to a General Theory of Information, also developed over the last twenty years, has several major components. In 2010, Mark Burgin described a new systematization approach, which he called a General Theory of Information GTI [Burgin, 2010], based on several ontological and axiological principles for the definition and use of different kinds of measurement and evaluation of information. Among the information measures of interest for this paper are his theoretical abstract and realist measures, especially the latter, of which quality is one example. In this view, there can be no universal measure of information, since information has not only properties but functions, and his GTI treats information from the functional, dynamic perspective. Burgin continues his useful classification by reference to semantic, qualitative, algorithmic, pragmatic, social, utility, economic and dynamic theories of information, all of which are shown to be sub-theories of GTI.

In another paper in this Journal, Burgin and I develop a further conception of information as a natural and/or social operator. What is of interest from the perspective of the present paper is that Burgin also emphasizes the primary role of energy in defining information.

### 2.4.1 Energy as Information

For Burgin, energy is an example of information in a broad sense, and thus the most basic natural operator. The three-dimensional energetic world is a flow of information and structural and kinetic information is an intrinsic component of the universe, independently of whether any form of intelligence can perceive it or not. Both Burgin and I therefore reject even more radical points of view such as expressed by Wheeler [Wheeler, 1990], who claimed that every item of the physical world is information-theoretic in origin. In this view, all such information is composed of a multitude of information operators, *e.g.*, information in an instruction is an information operator [Burgin and Brenner, 2010], however, point out that views such as those of Wheeler can lead to misunderstandings about the correct ontological relation of priority between information and matter-energy. It is the latter that is primitive, and failure to recognize this has often led to excessive idealizations of the concept of information.

### 2.4.2 Information as a Social Operator

However, information acts not only in nature but also in society, becoming (in the sense of Lupasco [Lupasco, 1973] a social operator, the role of which is essentially important in the modern Information Society.

The most common notion of an operator in society is, nevertheless, of a human being having control over the flows and use of knowledge and information [Castells 2000]. The operator approach to information as having causal efficacy in the society is somewhat different. First of all, I am not concerned only with the pragmatic consequences of the operation of quantitative informing about certain facts, which includes knowing that certain sentences are true in semantic theories of information or how to achieve simple results.

As pointed out by Leydesdorff [Leydesdorff, 2009], interactions between and among human beings are by definition reflexive, and can be considered as the basic operation of a social system. In turn, interaction between human beings usually is or includes communication, which is an exchange of information. The double contingency in which two individuals entertain (anticipate) expectations provides the basis for the formation of groups. Logic in Reality establishes the logical basis for the reciprocity of the interaction between 'self' and 'other', interactions that have been studied by Wu.

### 2.4.3 Interactions

Let us now explore further the central role of interactions in Wu's reasoning about information. His view of information as involving interactive processes is not new as such. What in my opinion needs to be emphasized is the way in which internal and external factors must be understood. These include the multi-level nature and characteristics of the actual and potential (virtual) interactions that mediate the construction and transformation of information in which they (the interactions) evolve logically and dialectically.

Wu Kun's focus on the causes of awareness and the intentional structure of human activities is neither trivial nor arbitrary. His "theory of interactions" has the simplicity of a single initial dimension and a single "polarization". (Polarization in Wu's sense here means a vectorial characteristic of complex phenomena toward higher complexity. It has the same intention as the movements toward non-contradiction or contradiction in the theory of Lupasco, within the overall energy gradient in the universe). Human knowledge is the most complex emergent phenomenon, the highest product of the evolution of the universe. The interpretation of the causes of the existence of human knowledge requires a coherent construction of the complex configuration space which includes (at least) the following new multi-dimensional entities: that of the interaction between a subject and a

target object; the subject's physiological structure, the structure of the understanding subject, the material components of social, that is, multi-subject practice, and that of their historical development.

For Wu, the interactions involved between internal cognitive and other structures (subject world) and the external object world take place in a chain of "step-by-step informational transformation, selection, construction and virtualization. The interactions are the links in the chains, each providing output to the next. However, Wu's key formulation is that "for a chain of interaction starting from the object, the information state constructed in the subject *will still retain some correspondence with the properties of the object* (emphasis mine)". The concept in Logic of Reality of processes evolving *via* chains of chains of chains, *etc.* of real implications explains, in my joint view, the nature of that correspondence or "similarity", namely, as the properties of the "object" potentialized in the "subject" and *vice versa*, as the chain evolves. This is what Wu refers to as the "match" in the cycling or recycling of information between subjective model and its objective "target" in nature.

In contemporary society, the importance of information is much higher and continues to grow rapidly. The application of information is one of the key sources of growth in the global economy, acting as both a social and economic operator. For a broad discussion of the emerging information-based Economy, I refer the reader to [Leydesdorff, 2006]. One of the consequences of information being a social operator in an economic environment is that information has become the key strategic asset for the 21st century. Every organization must invest in developing the best strategy for identifying, developing and applying the information assets – networks, processes and methods - it needs to succeed. Information operates (the behavior of) people, social organizations and social institutions and to stay competitive, companies must implement training and continual development programs to help maintain an efficient level of information resources utilization.

A peculiarity of information as an operator is that it can be (and usually is) an operator and an operand at the same time. Indeed, throughout history, people have always tried to manage their information as best they could, introducing new ideas, new methods, new processes and new strategies that enabled separate individuals, social groups and society as whole to better think and work. However, in the Information Society, individuals, teams, organizations, and between organizations have to find new ways to efficiently manage information. Researchers started to search radical and fundamentally new ways to accelerate information processes, such as identifying, creating, storing, sharing and applying information. In all these processes, information becomes an important actor, assuming the role of an operator and displaying the feature of self-operation. In essence, information as a natural operator is very important for self-regulation of various social systems.

The "language" of operators with regard to information is entirely compatible with the BTPI of Wu Kun and Logic in Reality as outlined in this paper. I note that these are broad concepts which also apply to Wu's Existential Field. It is not sufficient to say that information is in everything or everything is information without specifying why and how these statements describe reality and what the logical (in LIR terms) consequences are.

## 3 THE METAPHILOSOPHY OF WU KUN (1): DEFINITION AND THEORY

### 3.1 On Metaphilosophy

The subject of metaphilosophy is a somewhat unusual one for a discussion focused on science and technology. On closer inspection, as Wu Kun has observed in the case of information, a metaphilosophical approach is

essential to avoiding unnecessary and misleading distinctions between disciplines and their informational aspects.

A standard definition of the term metaphilosophy, one that is apparently simple and non-controversial, is a statement or set of statements about philosophy. For example, the *Journal of Metaphilosophy* lists the following definitions in its Aims and Scope: the foundation, scope, function and direction of philosophy, the following: the interrelations among schools or fields of philosophy: aspects of philosophical systems; the relation of philosophy to other disciplines and the justification (presumably by some form of truth-preservation) of philosophical methods and arguments. The concept that is lacking in this otherwise most desirable set of objectives, and also in the literature in general, is that of structure or function*ing*, in other words, the 'how' rather than the 'what' of philosophical argument.

I first note that a discussion of metaphilosophy requires a definition of both philosophy and the task of philosophy as well. In that of Sellars [Rosenberg, 2006], "the aim of philosophy is to understand how things in the broadest possible sense of the term hang together in the broadest possible sense of the term". Sellars contrasted the understanding of the world that is possible for perceiving human beings, considered as free, rational agents, capable of self-perception ("manifest images") and the entities present in the macro- and micro-physical world that is understood through science ("scientific images"). His intent was ultimately the merging of these two conceptions, one self-referential and one not, in a synoptic vision or synthesis of "persons-in-the-world".

Both Logic in Reality and the Basic Theory of the Philosophy of Information provide a basis for understanding both the metaphysical and epistemological dynamics of existence, that is, from where the properties of things come from that enable both them and the concepts of them to contrast, conflict and ultimately "hang together". In modern philosophy, one is struck by the frequent admission that not only are two conceptual descriptions, such as those alluded to above that are apparently irredeemably opposed, there is no basis available for preferring one to another. My answer to the problem is to recognize its source in the failure to describe correctly the relationship between the positions, objects, entities, and above all processes that constitute the real world including theories-in-contradiction.

The recursive relation between philosophy and metaphilosophy instantiates this principle: 1) no aspect of one is totally devoid of aspects of the other, and any absolute division into first- and second-order problems is arbitrary; 2) the question of an infinite regress of 'philosophies' does not arise. In the epistemology of LIR, iteration, in this case of *real* relations, stops after two or three stages because no new information is added by subsequent stages. The elements of knowledge and the knowledge of that knowledge are in a contradictorial relationship that exhausts the available mental configuration space. One can *imagine* an infinite regress as a process that does not stop, but in reality one stops it, or it stops itself.

A theory of metaphilosophy that talks only in terms of categorial separation or distinction between elements, disciplines or methodologies in philosophy is that of Toulmin [Toulmin, 1976]. In my view, any such theory has a certain limited domain of validity, in which it is more or less adequate or appropriate to the philosophy in question. The broader role of metaphilosophy for information and by implication for all other disciplines has been given by Wu: "Now, my research is still basically limited to elucidate the general basic theory of philosophy of information from the angle of a metaphilosophy. At such a level, there is a lot of work we should do to define the philosophical essence of information, the philosophical shape and form of information; the nature of the different levels of information; a philosophical measure of information; the relationship between information and various prior definitions of its scope; information ontology, information epistemology, information methodology; the evolution of

the informational world; information in material and social evolution; informational sociology and psychology; informational esthetics: an informational theory of value; there are still have very abundant and a large number of branch issues in the each area field of that listed above [Wu, 1989]."

My view thus offers a novel dialectic perspective on philosophy, metaphilosophy and their recursive relation. It naturalizes this relation, eliminating any implied circularity, since it does not require the total independence of premises and conclusion of standard logics. Starting from the fundamental properties of matter-energy, my theory permits a new approach to critical issues in both philosophy and science that is both logical and metaphilosophical.

As indicated in the Introduction, Wu's metaphilosophical view of information is not directed toward the codification of *a* Metaphilosophy of Information as yet another static discipline or body of knowledge. It is rather an attitude toward the position of an adequate Philosophy of Information as encompassing a critical component of all disciplines, beyond the scientific content specific to them. In my approach, metaphilosophy is not something 'more abstract' than philosophy and it must be able to deal with the essential aspects of all disciplines and their theories. As it exemplifies the suggested dynamics of Logic in Reality, it resembles real physical processes, and provides insight into the real interactions in the real world that are my ultimate concern.

### 3.2 Informational Thinking and the Metaphilosophy of Information

It is perhaps a first indication of an approaching maturity of the field of information that, based on the contribution of Wu Kun, one can begin to talk about a metaphilosophy of (a theory of) information that can accept the various approaches outlined in the previous Section without conflation. One of the consequences, however, is that the comprehensive nature of such a metaphilosophy, within the transdisciplinary paradigm defined in Section 1, establishes the role of those involved as a socio-political role, involving them in the social and ethical aspects of the informational components of reality.

The Metaphilosophy of Information, then, requires attention to the informational aspects of complex processes as a methodological necessity, in a process that Wu calls Informational Thinking. Informational Thinking *(IT)*, as conceived of by Wu, refers to a way of grasping and describing the essential characteristics and attributes of things by reference to the structure and dynamics of the information involved in their evolution, from their historical origins to future possibilities and probabilities. This strategy involves something like a Husserlian bracketing of the details of any complex process to consider the ways in which information functions in its dynamics, as well as the dialectical relations between its logical elements as proposed by LIR. However, the difference between Wu Kun's theory and that of Husserl is obvious: the purpose of Wu's original Philosophy of Information is to clarify the nature of the dual existence and dual evolution of material and information in the objective world, starting from the logic of the existence and dynamics of the natural human self. The phenomenology of Wu, unlike that of Husserl, does not have to be "naturalized", that is, brought into the domain of natural science[1]. It is already there. Wu then discloses directly the mechanisms of the processes involved in an

[1]The naturalization of Husserlian phenomenology was the subject of a major 1999 study: *Naturalizing Phenomenology. Issues in Contemporary Phenomenology and Cognitive Science.* Eds. Jean Petitot et al. Stanford University Press, Stanford. Wu's approach eliminates the arduous task of finding natural equivalents for Husserl's transcendental intuitions.

individual's understanding at the level of the integrated object and subject, with internal and external interactions providing the necessary multi-level objective and subjective mediation.

In this sense, all of the cognitive issues addressed by Wu, especially informational values, valence and social evolution, have implied the use of Informational Thinking for their analysis. *IT* requires the abandonment of thinking in absolute material terms in traditional material while retaining its commonsense foundations. *IT* is basically a methodological concept that, *via* the definitions of carriers and codes of information, enables *inferences* to be made about the historical and potential or probable future states of an information system. *IT* dialectically unifies energy factors and informational factors, determinism and indeterminism, internal and external feedback processes, independence (autonomy) and interdependence. LIR provides the additional *logical* structure for the dialectic interpretation of such a unified approach, based as I repeat on the impossibility of any total logical or physical separation between these dualities. In fact, Informational Thinking is the Metaphilosophy of Information in other terms.

To the extent that Informational Thinking requires the consideration of all the philosophical and scientific facets of information, I believe that we are close to a new scientific (and logical) paradigm where Informational Thinking, as opposed to thinking in terms of entities, results in new interpretations of, among other things, traditional disciplines and their theories. Above all, I see the (meta-) philosophy and (meta-) logic of information outlined here as a contribution to the naturalization of a process view of information as a whole. In other words, by seeing the relations between the changes in values that take place in human informational activities and the forms of society, a more profound understanding of information is possible that could be a contribution to overall progress and sustainable development of human civilization. Information Science, Metaphilosophy, Metalogic and Thinking may thus facilitate what Wu calls for, namely, a change in the commitment to and the interpretation of the dynamic oppositions in all complex natural processes in informational terms.

Through the study of information as one of the most basic features of existence, and the formalization of informational activities, the Metaphilosophy of Information of Wu can and should change the way basic philosophical – metaphysical, epistemological and ontological – issues are discussed. The Philosophy of Information supported by the new extension of logic to the same processes that it discusses, could be a "comprehensive revolution in philosophy", as LIR has been called "an important event in the current revolution in non-classical logics"[1].

As a final comment, I note the almost total absence of serious literature on the metaphilosophy of information. One exception is an article by Sebastian Sequoiah-Grayson, a collaborator of Floridi, entitled "The Metaphilosophy of Information [Sequoiah-Grayson, 2007]. The article is essentially in support of Floridi's concept of strongly semantic information, and in fact indicates only two items of content of a "metaphilosophy of information": 1) that it should include "Shannon's Premonition" that there will always be a multiplicity of theories of information and 2) explications of the pre-theoretical notion of information are to be judged by their usefulness. These ideas are more or less acceptable in the context of this paper, but they do not say very much. I have found no other serious references to the metaphilosophy of information. Wu Kun, through the substantial exposition outlined briefly in this paper, should be considered as the major pioneer in this field.

[1] He, Hua-Can. 2008. Personal communication.

### 3.3 The Informational Stance

I believe that the approaches that I have proposed in this paper describe primarily an attitude or stance, which I have termed the *Informational Stance*, a philosophical position and attitude that is most appropriate for, and above all not separated nor isolated from, the emerging science and philosophy of information itself. The Informational Stance [Saguillo, 2009] is an attitude that requires attention to the informational aspects of complex processes as a methodological necessity.

The concept of *stance* in recent philosophy was laid out by Bas van Fraassen in relation to his constructive empiricism. I will not reproduce here the debate about mathematical structural realism and scientific discovery to which it has led, but I can say the following: In his *The Empirical Stance* [van Fraassen, 2002] van Fraassen presented a new view of philosophical positions as 'stances' that involve judgments, aims and commitments in addition to the attitudes toward propositions (beliefs, hopes and knowledge) on which standard epistemology has functioned. However, van Frassen, in accord with his anti-realist conception of science, rejected any metaphysics of phenomena that has now been shown to be necessary. In the same Special Issue of *Synthèse* on Stance and Rationality, Ladyman [Ladyman, 2010] proposes a new "scientistic" stance, naturalized within his relational framework and suggests that science in fact depends for its success on dialectic between empiricism and materialism. The debate about materialism has been obscured by skeptic attacks that it requires positing of ontological entities for which there is no evidence. Logic in Reality, however, supports an "enhanced" form of materialism (scientific structural realism) as a basis for a scientistic stance that is a better logical basis for the dialectical interaction between empiricism and materialism.

The Informational Stance that I describe eliminates the necessity for even the points of empiricism that Ladyman would like to retain in his scientism, namely, "disdain for demands for explanation" and "the hostility to non-naturalistic metaphysics". My theory supports his idea that "we should have a metaphysical picture of the world to discipline scientific methodology, and science and education policy", and I note, as originally formulated by Wu, the non-separability of metaphysics, epistemology, value theory and social issues.

Summarizing, I view a stance as an interactive process, in which the human individual or group is engaged morally and politically, as well as being an epistemic observer in the standard philosophical sense. In fact, consistent with my overall logical approach, it is not necessary to make absolute separations between informational stance, thinking, philosophy and the ethical dimension. It is rather a question of alternating focus, and I place mine on the latter in the next and final Section.

### 3.4 The Ethical Dimension. Information and the Democratic Society

Among the major authors who have pioneered the dialogue on the ethical aspects of information I note again Luciano Floridi [Floridi, 2008] and Rafael Capurro [Capurro, 2008] in addition to Wu Kun.

Floridi was one of the first to define an Information Ethics (IE) that focuses on entities as informational objects, constituted by information at a fundamental level. As I discussed, [Brenner, 2010a], the most important consequence of this strategy that it generalizes the concept of moral agents, as IE is ontologically committed to an informational modeling of *being* as the whole informational field. The result is that no aspect of reality is extraneous to IE and the whole environment is taken into consideration.

In the "environmental" approach, IE moves from an epistemological conception to one which is typically ontological. Informational systems as such, rather than just living systems in general, are raised to the role of

agents and patients of any action, with environmental processes, changes and interactions are equally described informationally.

LIR is compatible with the indicated information view. The ontological feature of non-separability suggests strongly that there is not and cannot be any difference in the fundamental value or worth in the common component of all entities participating in existence, whose evolution and change involves the same logical principles operating on the same physical substrates. For LIR, the respect due to informational entities is a logical consequence of my general dialectic relationships to "external" objects, and to ourselves as patients as well as agents who have internalized these relationships.

I define Ethical Information (EI) as a sub-domain of the infosphere in which the most significant property of the information that is transferred is not its propositional truth *per se*, but its intentional content and corresponding impact on the receiver. Ethical Information is thus much less concerned by the physical, technological context or substrate, (*e.g.*, cyberspace) in which the behavior occurs as with the human agents involved. The consequence is that EI may apply strictly to human individual agents and groups and but not to artificial agents. The ethical value assigned in IE to artificial agents is obviously not the *same* as to living beings, and the difference is worth emphasizing to avoid some ill-founded confusion.

The clarification that Logic in Reality brings to the controversy, as indicated briefly in Section 3.4 above, is to relax the requirement that individuals and groups are *a priori* totally separate entities, and allow each to share part of the others properties, including intention. The shared properties are not 100% actual or actualized at one time; they can be present as potentials of which individuals are more or less vaguely conscious. As Floridi has clearly demonstrated, information can be among those shared properties.

Information exchanges thus take place in a psychological (or metapsychological) context which will largely determine both their ethical purport and its effect for and on the sender and receiver respectively. Like Floridi's Information Ethics, Ethical Information subsumes the simpler concepts if information described by Floridi in connection with earlier "microethical" theories of Information Ethics, but its primary reference is to complex informational process entities involving interactions at and *between* higher Levels of Abstraction, such as, for example, environmental programs and the data and theories supporting those programs.

Ethical Information in process terms is for me a reality in a physical space (as opposed to a data space), with an intentional "valence", positive and negative, in the morally valued interaction between producer and receiver. LIR is neither topic-neutral nor context independent, and can support an ethics involving apparently contradictory perspectives (*e.g.*, internalist and externalist, [Finlay and Schroeder, 2008], and assigns value to negative as well as positive information. Logan [Logan, 2010] has also pointed out the lack of attention paid to the qualitative as opposed to the quantitative aspects of information, that is, the need to incorporate a functional notion of meaning.

The result is that from quite a different starting point, Wu and I arrive at a key concept for a macroethics of information. We as human individuals share properties with other humans and other extant entities, living and non-living, constituted by the same substrates organized into the corresponding systems and process entities by the same principles and by their informational content. Both are accordingly deserving of respect and care.

In 1997, Wu Kun elaborated "An Outline of General Philosophy of Value; the philosophy of value explained in terms of natural entities". He proposed the application of a system of natural values to both matter and information, seeing value in all things (matter, information, including the subjective form of information – mental phenomena) that were a resultant of the interaction between internal and external processes, As Floridi did some

years later, Wu associates the material value and the informational value that emerge in the interactions. Natural value is "higher" than human value not in a moral sense, but in an the sense of being ontologically prior.

Introna [Introna, 2005] has made a useful phenomenological categorization of the ethical implications of information technology. They are similar to those of Wu in focusing on the operative interactions in which technology and society co-constitute or co-construct each other.

### 3.4.1 Information in Society and the Network Approach

Starting in the 1980's, Wu Kun studied social phenomena from the perspective of information activities, providing an information theory dealing with the nature of social information and an informational scale of social evolution. In the 1990's, Wu extended his research in this field to information production, the information economy and the information society, in a series of related papers and books. In Wu's conception, the active grasping, use, development, creation and implementation of information is the essence of human social behavior. The level of development, creation and use of information that a society achieves is a measure of its evolution. The development of different forms of human civilization takes place *via* different methods of information creation, processing and dissemination. Unlike matter-energy, which is conserved and not "creatable", human beings can only create information. Thus human production and productivity in essence can only be the production of information and corresponding modes of human information processing. In this process, a network development of modes for the creation and dissemination of information is accompanied by the resorption of the hegemony of centralized national control systems. This process is a "technical premise" for establishment of a new and democratic network system. Wu thus attaches substantial importance to a network concept of the structure of society. A comparison with that of Castells seems appropriate.

The major work of Castells on economic and political applications of new information and communication technologies in the emerging information society and knowledge-based economy, first published in 1993, [Castells, 2000], his *The Information Age: Economy, Society and Culture* has proven extremely prescient. He saw society as a complex system of networks that are a consequence of the new information and communication technologies. His views have been of interest from the LIR perspective because of their reference to a "logic" of the network society and of its dynamics. Castells' network model of society as a "space of flows" can be analyzed from the LIR logical standpoint, as well as more standard sociological models, *e.g.* Leydesdorff's "triple helix" [Leydesdorff, 2006]. The LIR logical approach is applied to an analysis of the properties of the networks and their nodes, as well as to the segments of the society that are disfavored or excluded completely.

For Wu, such networks can be "the liberator of knowledge, liberator of information, liberator of information creation and dissemination mode, the liberator of the social power, liberator of human relationships, liberator of human mode of thinking, liberator of human values, the liberators of human life-styles and behavioral mode, in the final analysis is the man himself liberator, human social liberator." Wu sees the decline of central, national modes of information processing and the popular development leading to a new democratic system consistent with the new trend. This new democratic system will have more tolerance and understanding, of minority rights, interests, values, and different views on the rights, interests and values of both the individual and the group will be more fully respected, perform and satisfaction. He is hopeful that the spread and development of network information processing, creation and transmission modes, allowing a multiplicity of human values, are the informational basis for a more just future society. In all of these considerations, however, I follow Tavani

[Tavani, 2007] who believes nothing has "happened" to change the core human values of life, liberty and justice, but any normative theory of the evolving technology and information based society still requires a correspondingly current view of morality and ethics. [Franssen *et al.*, 2010] point out the importance of ethics within the Philosophy of Technology, but standard logic does not address this major new field.

Magnani [Magnani, 2007] also discusses the changes that will be required in the application of ethical theory. He calls for a revitalization of research in ethics to achieve a "long-range ethics of responsibility", and deserves credit for accepting, analyzing and trying to prepare for the consequence of technological developments leading to what he sees as a *fait accompli.* He makes the rather unusual argument that since the current tendency is to ascribe high value to things one should value people as things, inversing the Kantian maxim of the necessity to treat people as ends. Magnani suggests that the primary impact of technology is effectively to create a man-machine hybrid. This entity, however, has the same moral obligations, defined as Kantian duties, as humans have always had, but now primarily related to knowledge, far more easily accessible than in Kant's day. People have a right and duty *to* knowledge as such and as a basis for action.

Human interests should be at the heart of any proposals for change in the 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 the fundamental embodiment of contrary, anti-social and anti-civilizational forces in the society that make the "common struggle" for implementation of the human values discussed above a struggle indeed.

Thus Wu calls for a "new democratic system" that would permit maximization of the benefits from the new information technologies. As noted above, 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. In any event, proper attention to the informational aspects of any politico-economic model is necessary, and would be the consequence of the Informational Thinking and Informational Stance described above.

## 4 THE METAPHILOSOPHY OF WU KUN (2): INFORMATION SCIENCE, THE UNIFICATION OF KNOWLEDGE AND A NEW CRITIQUE

Elaborating further on the hermeneutics of information science, Wu Kun conceives its advent in essence as a scientific paradigm shift, involving a total transformation and reform of traditional science. In this new paradigm, a number of things take place:

- The establishment of a Unified Information Theory (UIT) is not only possible, but inevitable.
- There are major consequences for the unification of knowledge.
- A new critique of philosophy can be formulated

Regarding the first point, Wu believes that the establishment of a UIT would require answering the core question of the essence of information. According to Wu, there is a tendency in modern western theory to try to avoid definitions, but this tendency is only suitable for the deconstruction of existing scientific concepts and theories, but not for building new ones. For example, a UIT could involve a new process of theory construction.

The concept of change of scientific paradigm suggested by Wu is similar to that proposed by Cao for the ontology of the development of science. Both allow a certain ontological continuity accompanying a conceptual revolution [Cao, 1997]. This ontological *synthesis* is a dialectical picture of growth and progress in science that reconciles

essential continuity with discontinuous appearance in the history of science, a process that, again, is a logical one in LIR.

From the systems point of view, for all the concepts involved in the establishment of a theory, it should be possible to group them in a way that would enable a firm and clear interpretation. Otherwise, these concepts and theories can not be properly understood.

In Wu's conception, the nature of information is such that it is involved in the constitution of the basic areas of existence of the world, revealing their essence and most general, universal characteristics. Such universality can only be studied at the highest level of general philosophy. Because of this, a UIT can be expected to have the structure and nature of a general philosophical theory. Only from the vantage point of the philosophy of information can one perceive the essence of information that is required for building a Unified Information Theory.

Regarding the consequences for the academic disciplines, in a recently completed thesis, Wu Kun suggested that studies in philosophy, ontology, epistemology, methodology, language theory, practice theory, value theory, existentialism and so on should be unified, leading to an eventual unification of knowledge. Even more importantly, perhaps, he wrote that "innovation in philosophical theory does not simply lie in its areas of concern or as related to a range of subjects, but more in the inherent or implied domains: relevance theory in the basic areas; points of view; distinguishing new from old theoretical content and so on".

In fact, in my opinion, based on his Philosophy and Metaphilosophy of Information, Wu is proposing a major new critique of the foundations of philosophy! In this view, up till now all philosophical theory, all schools of philosophy have proposed theories that attempt to understand the scope of the general field of existence as a foundation for the understanding of the relationships between people and objects (or the world). This mode of understanding focused mainly around the relationships between matter and "spirit", or the relationship between subject and object. The difference between different schools and theories of philosophy lies in how these relationships or aspects of them are rejected or eliminated, or which should be emphasized or made dominant. The most extreme theories take the spirit or elements and modes of certain activities to a position of absolute supremacy, absolute, exclusive, one-sided and oversimplified. (This tendency was also described by Lupasco as a drive toward identity and certainty, for which he saw the fundamental psychological basis in the non-identity and non-certainty of human existence.) In view of this, despite the development of a humanistic philosophical theory in some research areas in the direction of a conversion of research toward new concerns, on the foundation of existence theory and epistemology no fundamental change has ever been achieved. One is left with the same fundamental commitments and concrete interpretations of existence based on the binary oppositions between matter and spirit, between subject and object and so on. Based on this analysis, so far, philosophy has never accepted any truly meaningful change in its fundamental approach.

On the other hand, Wu Kun takes the concept of information as the most fundamental one for philosophy, leading as we have seen to a novel model for the partition of the existence field that changes the way concrete expressions about basic philosophical issues can be made. The result is that the new Philosophy of Information enables a "conversion" of the fundamental bases of philosophy that can lead to further fundamental and desirable universal changes in the philosophy of man [Wu, 2009].

## CONCLUSIONS AND OUTLOOK

This paper has suggested the importance of several partly informal theories as providing an essential new perspective for progress toward a General Information Theory. The outline that I have provided here of these theories is both the minimum necessary for some understanding of them and the maximum possible given the limitations of space. Logic in Reality (LIR) provides a new logical or metalogical, transdisciplinary framework for the discussion of philosophy in relation to information, and I have come to the conclusion that the concomitant use of LIR, together with the Basic Theory of the Philosophy of Information (BTPI) to describe information and its operation in society is unavoidable. Both the BTPI and LIR are grounded in physics, and they avoid the reductionism inherent in purely linguistic, semantic or semiotic theories of information that reflect principles of standard bivalent logics.

My major conclusion is that the BTPI of Wu, his new informational view of the need for unification of critical disciplines and their formulation as a metaphilosophy constitute a major contribution, as yet unrecognized outside China, to the General Theory of Information. I conclude further that the theories described in this paper constitute part of a new transdisciplinary paradigm, in which information has a central role in the transformation of the society and its approach to knowledge and the classical separation of the academic disciplines. In fact, Wu's approach constitutes and new, original and in my view necessary critique of the bases of modern philosophy as a whole. Application of my interpretation of the Logic in Reality together with Wu's Metaphilosophy of Information could be a useful new strategy for resolving critical outstanding issues in the field of information and provide further support for an ethical development of the Information Society.

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