Wu Kun
Joseph E. Brenner

THE INFORMATIONAL STANCE: PHILOSOPHY AND LOGIC. Part II
From physics to society[*]

Abstract.   In Part I of our joint paper [WuB13], we outlined our respective theories, The Basic Theory of the Philosophy of Information (BTPI) and Logic in Reality (LIR) and showed their synergy for the understanding of complex informational processes. In this part, we develop Wu's fundamental philosophical insight of the origin of the values of information in the interactions of complex information processing. A key concept in our work is that of a logical isomorphism between human individual and social value and the natural laws of the physical world. On the basis of Wu's concept of Informational Thinking, we propose an Informational Stance, a philosophical stance that is most appropriate for, and not separated nor isolated from, the emerging unified theory of information. We propose our metaphilosophy and metalogic of information as further support for the ethical development of the Information Society.

Keywords: dialectics, dynamics, ethics, information, interactions, logic, ontology, phenomenology, systems, values, transdisciplinarity.

Introduction

The most critical dimension of human and in fact of all existence is its irreducible moral value and man's consequent individual and social moral responsibility. The ontological framework developed in this part includes further aspects of Wu's new philosophy of information (Basic

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[*] Wu Tianqi, Translator (Chinese–English).

Theory of the Philosophy of Information; BTPI; [Wu10]) and the new
logic applicable to it (Logic in Reality; LIR; [Bre08]), and it provides a
description and interpretation of this dimension in informational terms.

Outline of Part II. Section 5 discusses the grounding of informational
phenomena in physics, where the different approaches of BTPI and LIR
provide the basis for further discussion of this still open issue.

Section 6 is the core thesis of our joint approach, showing the essen-
tial functional and *logical* connection between informational interactions
and values. Section 7 looks at the social evolution of information and the
informational society. Section 8 is an argument for the metaphilosophical
nature of the philosophy of information and the interdisciplinary nature
of information science. Section 9 further develops Wu Kun's philoso-
phy of information as a metaphilosophy, whose theoretical and practical
aspects are supported by Logic in Reality.

Our concluding Section 10 discusses Wu Kun's concept of Informa-
tional Thinking, leading to an informational stance, an attitude that
requires attention to the informational aspects of complex processes as a
methodological necessity, with potentially positive consequences for the
understanding of information in society.

5. The basic physics of information. The role of energy

5.1. Information and cosmology

Most non-physicists understand the theory of general relativity and its
implications for time and space in a loose metaphorical manner, and the
connection to complex phenomena such as information is not normally
discussed. More recent theories, which provide further basis for the
absence of a primitive background space-time, are even less accessible.
In our opinion, however, it is only these most recent cosmological ap-
proaches that ultimately provide a ground for a theory of information,
as well as other complex processes.

In the *BTPI*, Wu points out first that information requires a frame-
work in which space and time not only evolve together, but share some
on one another's properties, such that, in terms close to those used by
Lupasco, time is (partly) spatialized and space (partly) temporized. In-
formation, for Wu, is a "condensation" of the evolutionary history of

processes for which the dynamics, we now can say, follow the principles of Logic in Reality. As Brenner has shown, following Lupasco [Lup86], the mutual transformations between times and spaces follow the same dialectics. Let us bracket for the moment, however, the question of whether these transformations, which clearly instantiate non-predictability, are also totally deterministic.

5.2. Randomness and interaction

From a philosophical standpoint, Wu proposes a new recognition of the fundamental role of matter-energy without absolute materialist or idealist conceptions. Wu's construction of the foundations of existence and properties of information starts from a physical standpoint with the relativity of space-time. Continuing with super-string theory, Wu sees in the vibration and complex interactions between open and closed strings the source of the discontinuities in the world, and their random formation and disappearance the necessary basis for the non-linear interactions that characterize the phenomenological macro-world. In other words, he *postulates* that the random fluctuation of the micro-world is the root of the irregular, random, complex, global and unpredictable features of real systems.

Despite the fundamentality of internal randomness, there is a "certain intrinsic consistent, complementary relationship" that can explain features of the systems, even within the overall non-linearity of the world. The link to information is in Wu's key statement that "in the most general sense, evolution is achieved through the interaction between things", an interactive process that is at the same time a process of information transmission and reception, in which the direct existence of "things" (see Part I, Section 3) is transformed into an indirect existence and conserved as information. Thus things in general are always characterized by information about their prior, historical evolution and present states, but also have, as an aggregate of possibilities, information about future states. In the terms of LIR, the carriers of the latter are the latent "unsaturated" potentialities of the system and it is, also, the orderly pattern of evolving actualities and potentialities that we suggest corresponds to the intrinsic consistency noted by Wu.

Since every object in the world, for Wu, is the unity of its direct and indirect existence, all display a "double evolution" of both their physical and informational constituents: material form and informational form

co-evolve. The mode of this evolution is referred to by Wu as "non-perfect determinism", in other words, simple linear interactions exemplify a more or less strict determinism. Complex non-linear processes, however, for which the standard picture of space-time is inapplicable, one that are heterogeneous, discontinuous, exhibiting non-smooth fractal behavior, in essence can not be completely deterministic.

In the Wu–Brenner view, based on the LIR dialectics, the conflicting two aspects are not mutually independent or exclusive, and in a number of different areas at the same time or in the same areas at different times both play a role.

In his Section on Complexity and the Program of Information Science (see [Wu10]), 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. Like 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 Brenner 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. However, as Wu Kun has argued, it is within the system and between systems and the environment that a network of multi-level feedback loops of complex information determines the system and the general way and the path of its development and evolution. This concept is also to be found in Deacon [Dea11].

5.3. Self-dualism and dualism of matter-energy

Wu Kun's dual existence and dual evolution theory correspond to the LIR view of the structure of the world, but LIR sees the origin of its key non-linear features in the Principle of Dynamic Opposition (PDO) derived from the self-duality and duality of quantum entities. This is the origin of the various mutual constraints and coherent coordination between a system as a whole and its parts and their internal and external interactions.

The definition of information as related to the thermodynamic evolution of physical processes outlined above is necessary but not sufficient, since the more fundamental sub-quantum levels of reality may indeed have consequences for the properties of information in the macro-world,

a question raised by Wu. He pointed to the still little understood complex interactions postulated in super-string theory, and other interpretations of the structure of the quantum vacuum, such as those of Conrad, are also the subject of active discussion.

What seems most likely at the present time is that an inherent random non-linearity below the level of quantum particles affects their behavior, acting as the source of *both* the linear and non-linear processes occurring at higher levels of reality, the macro-world. On the other hand, the appearance of *randomness* in the macro-world does not require it as the basis for the complex properties of information. Information has linear *and* non-linear characteristics, displays consistencies *and* inconsistencies, continuities *and* discontinuities. These both permit and are a consequence of Wu's "double evolution", that is the real structure of change, the structure of real change, and they can be explicated by the contradictorial principles of LIR.

From the point of view of Logic in Reality, there is no necessity for a direct and still undemonstrated energetic interaction between sub-quantum and super-quantum worlds. It is sufficient, as has been shown also by Matsuno, that the principle of absolute non-contradiction in regard to reality, as opposed to language, be relaxed. Thus, as was also imagined by Gell-Mann, if the path of every complex particle from its origin at the Big Bang or an equivalent cyclical model of the universe were determined, the self-duality of quantum particles, its translation into the fundamental dualities of matter-energy and epistemological ignorance of those paths would be sufficient to establish the dynamics of emergent biological, individual human and social structures, including information processes, without recourse to any Kantian transcendence.

From LIR standpoint, in a natural evolutionary process, neither internal nor external events are ontologically random, since the environment is never totally decoupled from the evolving system, and every element of it has also followed a deterministic path.

In Wu Kun's interpretation, it is this path that shows the *trace* of information evolving in things. In the space-time transformation of the interactions involved in real processes, the condensation of the information present produces a holographic result in which there is a spatialization of time and a temporalization of space. It is the result of the materiality of things and a worldview in which there is human knowledge of that dual existence. Using the previously discussed concept of Wu Kun that matter and energy are "objective reality" at the philosophical level, they are at

the same time the philosophical material category we have designated as the informational field. Therefore, for Wu Kun, dual existence does not refer to the dual existence of material (mass) and energy in sense of physics, but to the dual existence of matter (including the physics of matter and energy in communication processes) and information in the philosophical sense. Consistent with this, Wu Kun said dual evolution also refers to material and informational dual evolution in the philosophical sense, rather than the dual evolution of the material (mass) and energy in the physical sense.

5.4. The Dual Evolution of Matter and Information

The important conclusion for a theory 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 our view what constitutes information.

We have indicated previously (see Part I, Section 3.2, [WuB13]) the different Wu types of information (in-itself, for-itself, regeneration and social information) according to the level of its development.

The concept of "informosome" has been used by Wu to describe the basic principle of interaction between subject and object. 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.

What LIR adds to this picture, *is that each intermediary step is itself an energetic process that follows the LIR axioms of Conditional Contradiction, Functional Association and has the potential for the emergence of a new entity* (*Included Middle*). In other words, as the interaction

between subject and object progresses, changes will take place and can in some cases be observed in the degree of identity and diversity of the entities involved, with one aspect actualized or potentialized at the expense of the other.

To end this chapter on our new basic theory of information, let us discuss the question; is information, like substances (mass and energy), always conserved? The easiest answer to this question comes from the most basic level, that is, whether there is separability between a material and its structure, because the information is encoded by the material structure. Thus, we first make the new suggestion in line with the principles of LIR is that information as actuality can be lost in part but is compensated by information as the new potentiality of that "ex-information". At higher levels of reality, one should look at the information content of a book or a computer disc as including all the processes involved in its production and subsequent use. If the book or disc is burned, some if not all of the encoding is retained in non-localized on-going processes in humans as organisms operating as what Wu refers to as "information vehicles" that have meaning and value, meaning and value being substantially equivalent.

In his BTPI, Wu Kun puts forward another new point of view: information is not necessarily conserved because it can be partially or wholly dissipated or changed. However, on a general abstract level, such a process also signifies some degree of conservation. Although the corresponding changes in the structure of material objects will lead to the dissipation or loss of original information, the new structure after the change will embody some new information, so that between the generation of new information and the dissipation of the old a compensatory mechanism of reciprocal correspondence and conversion will be established. In Wu's dual existence and the dual theory of evolution, changes and the conversion of quality — energy structure is always concomitant with the change and conversion of the information, while the changes and conversion of the quality — energy structure of things is the change of the information content and conversion process.

In the early 1980s, Wu Kun proposed the concept of absolute and relative amounts of information. The absolute amount of information is that which corresponds to that necessary to describe the material object itself. If matter is conserved, then corresponding with the material property of the conservation of matter, this property shows the (maximum) amount of information that could have been conserved. At present,

within both the scientific community and the general philosophical community, the concept of an amount of information that is discussed refers not to the absolute amount but primarily to the relative amount. The focus of the relative amount of information is not to measure the information that corresponds to matter (including qualitative information included in the absolute amount of information), but only what in relation to information activities involved changes in the recipient of information. It is in this sense that information is not a conserved quantity.

Computational theories of the universe, on the other hand, tend to focus on a structure of bits of information, rather than changes, which can be considered as absolute amounts of information in the Wu sense. LIR thus provides further basis for the emergence of (partially) new informational structures that explicates Wu's concept of an "information teleonomy" at the social level.

This summarizes the basic theoretical content of the Wu and Brenner systems.

6. Information, interactions and values

Wu Kun's fundamental philosophical insight was that the origin of the values of information lies in the interactions in the information processing involved in real, complex processes. In this section, which constitutes the core thesis of both papers, we will show, using the logical principles of LIR, the essential functional and *logical* connection between informational interactions and values. The key concepts, which appear both in Wu Kun and in Brenner (as categorial features of the LIR ontology), are those of non-separability and an interactive process view of information and informational activities. In our view, there is a logical isomorphism between human individual and social value and the natural laws of the physical world governing the natural processes embedded in the human at all levels of reality (macrophysical, biological and cognitive-social). In support of this proposal, we note the indicated basis of our combined theory in energy and its consequences for the physical interactions that are involved in the processes of generation, transmission and reception of information.

The most important principle that Wu Kun applies to human existence and human informational activities is the non-separability of human individual "natural" categorial features and multi-dimensional physical, psychological and behavioral social features. Non-Separability

is at the same time the most important categorial feature of the categorial ontology associated with Logic in Reality. Wu uses the term "multi-dimensional" to describe people and human existence and sees it as a "complex synthesis" of relationships, the unity of mapping between natural and social existence.

Information is of course expressed in different forms at the indicated different levels or dimensions of human existence. Physiology, psychology and behavior are in the familiar hierarchical relationship, where non-deterministic aspects (real or apparent) increase with the complexity of the levels. LIR supports these concepts by providing its general scheme of dynamic opposition for the interactive relations in and between levels.

6.1. The chain of interactions

Let us now explore further the central role of interactions in Wu Kun's reasoning about information. The view of information as involving interactive processes is not new as such. What in our opinion needs to be emphasized is the way in which internal and external factors must be viewed and in which interactions evolve logically and dialectically.

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 and construction". 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 Brenner). This logical view of the evolution of processes implies that through these chains of chains of interactions, a certain real informational content appears. In other words, if we take as the elements in interaction a general "subject" and "object", the corresponding property of the object or essence of "similarity" will change and the nature of the "object" will be reflected in the nature of "subject", and the nature of "subject" will be projected onto subjective state of mapping of the "object". Wu had applied this principle to a concept to human understanding: it is a process in which exists some sort of transformation of essence, a mutual "match" of restructuring and rebuilding involving subjective model information and the understanding of objective information as an "object".

6.2. Information value theory

Wu Kun's definition in the BTPI is that value is the effect resulting from or in a Kantian sense constituted by the interaction between the internal and external aspects of things — matter and information. The relation to interactions is clear: "Interaction is the way of existence of things", and the most basic facts of existence are the existence of things (including processes) themselves and the consequences of their interactions.

As material and informational structures change and evolve horizontally and new structures emerge vertically, all the interactions involved have value. The relationships are expressed in LIR as following the Principle of Dynamic Opposition which is constitutive in the sense of establishing the critical relation of interactive coordination inherent in phenomena.

Wu considers thus that the most fundamental value, as also stressed by Floridi and Brenner, is the value of existence itself (natural law value). The intrinsic value of things is then generated through the interaction between their internal and external aspects, or, in other terms, between content and context. We see immediately the importance of the dynamic logical view of the internal-external interaction, (see Part I, Section 2.1.2.) The most basic forms of value are material, and the lowest levels of information with which it is associated and the higher cognitive values of subjective information, that is, human values (see Section 9).

Whether the interaction is in or between the information system, the physical system or the cognitive system, all result in the generation of value due to the "togetherness" or non-separability of these systems. Further, physical and informational effects, material value and informational value have in Wu's view the characteristics of simultaneity, necessity and universality. Logic in Reality would only suggest the modification of these characteristics to include somewhat more explicitly the dialectics of simultaneity and *succession* that in fact supports Wu's concept of "time continuation". LIR is the logic of interactions, the logical order of the interaction of things in which first material value is created, takes its form and then develops into informational values.

To conclude, the key concept is that any change, movement or evolution involves the interaction between things results in both material and informational value. In this philosophy of value the interaction is not itself the value, but the process in which the value is generated. We have in this picture the necessary basis for a further discussion of the

qualitative properties of information, since the bits that are the carriers of quantitative information are meaningless in themselves and clearly do not interact.

6.3. Human values and information

It is the next stage in the process, by what Wu calls the "trichotomy principle", that the three most fundamental values are constituted, namely by material, in-itself informational and cognitive subjective values. Human values are the consequence, then, of a kind of *backward projection* from the accepted irreducible value of human life onto the processes at its origin. Social values, rather than being simply equivalent to human values (since humans cannot exist apart from society), are better expressed as not a basic form of value but the unification of the indicated basic forms. We stress that the importance of this principle is its capability of covering both human and "natural" or non-human value at the same time, without using the same terminology to describe the two.

In our opinion, the Wu approach to informational value theory fits Brenner's thesis, accepted by Wu, is that the values conveyed by information should be viewed as positive, negative or neutral in terms of their effect on both sender and receiver, and the dynamics of the relation between them (who produces the effect). This corresponds to a property or characteristic of qualitative information in process terms as a reality in a physical space (as opposed to a data space, cf. Floridi [Flo10]), in a morally valued interaction between producer and receiver. According to Wu, although the effect of interaction can lead to positive, negative, or neutral effects, but in any case, some of relationships involved *are* the values. LIR is neither topic-neutral nor context independent. It can support at the same time the value of including both positive and negative view of the contradictory nature of value and the information theory of value and assigns equal ontological value to negative as well as positive information, as noted.

LIR uses the term negative information to mean intended messages in a necessarily social context that have negative or unnecessarily and unfounded pessimistic content with, probably, negative consequences for the receiver. This point is made by Capurro [Cap08] who also calls attention to the philosophical necessity, for a theory of information in reality that refers to the existentiality of our "being-in-the-world-with others", to include a discussion of misinformation and its interwovenness

(non-separability) from information. In his view, it is the absence of separation that insures that information science is a hermeneutic science and accordingly a foundation of an ethics of information. (For a further discussion of ethical information cf. [Bre10]).

7. The information society

The relation between the individual and the society of which he is a part is extremely complex, but the informational and logical perspectives we propose provide a new approach to a potential theory of the Information Society. We believe that the "information society" involves an information and knowledge-based economy in which processing of information and development and application of technology for its dissemination occupy a dominant position among available methods of social development. Information is the source of knowledge [Zho10], which is the basis of the knowledge-based economy, and together they can constitute a knowledge-based society. However, our analysis highlights the key point that in the information society, the economic value of information and knowledge is not and cannot be natural, since it is simply not realistically possible, given the different interests of groups and individuals, to insure a balanced distribution of such value.

The two again related processes of interest are 1) the interaction between an individual and the class or social group and 2) the process by which an individual internalizes the prevailing worldview and objectives of the group.

Regarding the first point, we note that the classic notions of set or class and member of a class do not apply, as there is no provision for any mutual interaction in the standard bivalent logic which underlies standard set theory. The bidirectional interactions which clearly exist, however, which Wu refers to as two-way process activities, are easily describable using the principles of LIR. For any process, the major perspectives for examining such activities have to be based on the feedback loop of interaction between individual and group. The Principle of Dynamic Opposition of Logic in Reality suggests a new definition of what constitutes the relationship between an individual and a group [Bre10].

In the LIR two-level framework for analysis, groups can no longer be considered, at the social level, as the equivalent of a set composed of individuals, equivalent to members of the set. Classical set theory

requires that sets and their members be completely distinct, and set theory is essentially bivalent logic in another form. Any group, as long as it is a real group, can not produce a totally new set of external relations, since human beings individually and collectively share a mutual external existence. Collective groups share, even in standard philosophy, some cognitive properties such as opinions or objectives. LIR sees this sharing as a dynamic process, I Individual and group goals can be the same or different. The group's goal may be to join forces in such a way as to favor individual goals, but the group may in turn dominate individual behavior. As Wu puts it, social essence can be explained by human essence and *vice versa.*

7.1. Consciousness, language and labor

The specific psychological and behavioral capacities of humans can be divided for analysis into consciousness, language and collective organization for work or labor. From the informational perspective, consciousness corresponds to subjective indirect existence (cf. Section 7). As is commonly accepted, the human language system is the result of human capacity for abstract thought and results in the creation of subjective information.

Human society, once presented as a given, can be analyzed according to Wu as a complex of human capacities for language, modification of nature in general and a higher-level capacity for an organized or planned "production practices" based on human teleonomy (see Part I, Section 3.4, [WuB13]), subsumed under the term of "labor". Thus, labor, language and consciousness have become the essence of man and human society. From the point of view of information activities, consciousness enables humans to grasp and create activities of information, and language is the carrier of consciousness.

Wu has discussed the many informational aspects of labor in detail in the BTPI. From the fundamental theoretical standpoint of this paper, the purpose of human labor is to implement some program or process to effect changes in some material object. However, due to the principle of conservation of matter/energy human labor cannot create matter, but only information, so that from the information activities of the dimensions of view, the essence of human society lies in the "dynamic grasp, use, development, creation and production of information" [Wu84].

7.2. The social evolution of information

Throughout his writings on the philosophy of information, Wu Kun places special emphasis on the social value and functions of information, suggesting that from its related value and functionality a theoretical basis for the unity of human individual and social existence can be achieved. Logic in Reality formalizes this "unity" as a logical dialectical conjunction that emphasizes the mutual, multidimensional interactions involved. Wu also uses the equivalent terms, also compatible with LIR, of "complex togetherness" and a holographic rule. The following discussion is a consequence of the definition of the relation between information and human values above.

According to Wu Kun, human beings have a multidimensional existence. However, inherent in their physical, psychological and behavioral structure is a (residual) two-dimensional structure, one dimension of which is established in the course of natural development, while the second dimension of the structure involves the acquisition of culture. It is in this process of second dimensional structure building that is generated the distinction between humans and animals, during a non-deterministic evolutionary process in which the gene acquires a two-dimensional informational structure [Wu94]. (It should be obvious to the reader that "one" and "two" here refer simply to lower and intermediate orders of multidimensionality. At this point, attempting the task of trying to quantify the number of dimensions does not seem necessary.)

As previously suggested, this non-deterministic picture is *sufficient but not necessary* to establish the differentiation between human and animal, for which the LIR concept of residual potentialities and emergence provides an alternative. The ability of humans to form societies based on the transmission of non-genetic information, *vis à vis* social insects, for example does not require a discontinuity in the logical form of the applicable evolutionary processes.

The essential conclusion of this study, however, is the agreement of the BTPI and LIR on the intrinsic unity, involving dialectical processes of exchange of information and action, of the individual and society, better, an individual and his group or class. As noted above, the standard conception of classes or sets and their members is replaced in LIR by one in which classes and their members share aspects of one another's properties. The interaction provides the basis for influence of an individual on his class and *vice versa*, the latter involving the internalization

of some of its precepts. The concept of a class is thus of a dynamic, non-abstract entity that can be causally effective. This is similar to the interpretation in contemporary complexity theory of the two-way emergence of holographic mapping relationships between wholes and parts. However, complexity theory fails to provide a basis for basis for *dynamic* interactions between whole and part which allows one to share some of the other's properties.

7.3. Cultural evolution

According to Wu, once some concept of human social evolution as real change is accepted, it is best seen as cultural evolution for which Wu proposes the term *in vitro* evolution referring to the evolution of external cultural traditions and patterns, while *in vivo* evolution is essentially static, long-term genetic evolution. Cultural evolution *in vitro* and genetic evolution *in vivo* have a kind of mutual synergy [Wu94]. However, this should not be seen as involving any changes in human genes at the chromosomal level of encoding, but only in the changes in procedural information due to changes in the content of the of the phenotype. Thus, as the internal structure of a special human "informosome", we can distinguish two different levels of information: procedural information of deep coding in the genetic structure and another is based on procedural information exhibited by the phenotype.

The former has the potential for eventual expression, but it must rely on an acquired environmental informational intermediary. Therefore, due to the diversity and the specific nature of environmental information, therefore, the state and content of the latter will have features of diversity and complexity. Depending on this intermediary information, the expression of the same procedural information will differ, as is shown for example in language development.

Procedural information refers to the structural information (operators in the sense of Brenner and Burgin [Bre11]) in objects or processes which provide the ways and means for the further evolution of information. As providing for the possibility of future states, this type of procedural information is part of the indirect existence of things. The operation of procedural information is similar to the implementation of generation rules in fractal theory that result in fractal structures. Thus the genetic information in DNA provides a fractal rule for coding the various systems in an organism necessary for the construction

of an entity and not all of the general principles, methods, procedures and detailed structures of the components necessary to control biological development.

Cultural (*in vitro*) evolution is thus eminently an informational phenomenon, both the evolution of psychological and behavioral patterns and the change in which humans process information in its aspects of indirect existence. From the LIR standpoint, however, it is necessary to point out that this evolution is not and cannot be unidirectional, as it is the resultant of conflicting or contradictorial forces. Cultural evolution is unavoidably accompanied by cultural and social regression of which the excesses of the Internet and the degradation of language are all-too-familiar examples.

Mayr [May04] and other biologists have argued that the use of the term "evolution" in relation to society is incorrect, to the extent that there is nothing in the society that corresponds exactly to, and has the physical properties of the genome, the species, or the process of reproduction. However, as expressed in the Biological Synthesis of Reid [Rei07], what is required is replacing a selection theory, a Darwinism or neo-Darwinism, essentially reductionist (and describable by standard bivalent logic) with a theory of emergence. This in essence what WK says in his remark about the "mutual coordination" of *in vitro and in vivo* evolution.

The biologist E. O. Wilson has developed a model of social evolution [Bre09], based on insect, animal and human data that accounts in its current form for most of the dynamics of individual and group selection. Most importantly for this study, it describes the origin and relative evolutionary success of altruism or groups in which altruistic individual predominate. His theory clearly acknowledges the dialectic character of the situation in his dictum: "Selfishness beats altruism within groups. Altruistic groups beat selfish groups. Everything else is commentary". We call the attention of the reader to the obvious, but usually ignored concept that nothing in this picture is 100% true or applicable in all cases.

7.4. Models of the information society. Networks

In this initial overview in English of the applications made by Wu Kun of his theory and philosophy of information, and its relation to Logic in Reality, suggesting any comprehensive economic-political model as such for the emerging Information Society would be outside its scope. Nevertheless, it is essential for the understanding of Wu's BTPI, elaborated over a period of 30 years as we have indicated, that it includes a informational perspective for studying social phenomena and provides working social information theory of the essence information in a social evolutionary context.

As shown by Wu [Wu97], forms of human civilization can be differentiated according to their different ways of creating, processing, dissemination and development of information. As indicated above, human beings can create only information. Therefore, human production and productivity is essentially only information production and information productivity, and models of the economy and market activity are informational models.

The expanded 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 is a technical prerequisite to building a new democratic society [Wu01].

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 [Cas00], 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" [Ley06]. 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.

Castells also describes the structure and dynamics of *resistance* to the hegemony of the network, and such resistance, like other opposi-

tional elements, can be described in LIR terms, as follows: LIR is a methodology of reasoning, a way of doing reasoning. Here, reasoning about the evolution of the society using both aspects of the model, the network and the resistance to it, provides a better understanding of the forces at work and the relationships between the actors involved (inside and outside the network), given the ambiguities and inconsistencies in their approaches to society. The basis of an evolutionary theory of the Information Society [Hof07] is suggested. The normative characteristics of LIR provide the basis for further discussion of ethics and points toward the development of an evolutionary ethical theory of the information society. Thus both LIR and the BTPI benefit from the methodology of a dialectic approach without unnecessary commitment to any ideological consequences for a model of society. Wu sees wills essentially therefore the importance attached to a network based on the concept of social structure. Comparison of the Wu and Castells network concept suggests that it is the appropriate one for further elaboration (see below).

7.5. Towards a new democratic system

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.

New trends toward a more pluralistic, democratic society as it is usually understood can be seen in a number of areas, however, the central role of information has been most developed by Wu Kun. Thus Wu calls for a "new democratic system" that would permit maximization of the benefits from the new information technologies. 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 in our concluding Section 10.

8. Transdisciplinarity and the philosophy of information

By the date of these papers, the Philosophy of Information (PI), including Wu Kun's Basic Theory (BTPI) and its implications for an informational view of society can be clearly seen as a fundamentally innovative new field of philosophical and scientific investigation.

As information is described in this paper, a property of all entities, physical and non-physical, information and information activities must be studied *all* theoretical and practical disciplines, especially the cognitive and social sciences. Now, we believe that taking information theory and the philosophy of information as multi-disciplinary or transdisciplinary provides substantial new inspiration for current research in science and philosophy in general.

Transdisciplinarity has been defined by Nicolescu as what is common to all disciplines [Nic02] and therefore contributes to focusing on what unites rather than separates them, in the interest of a conception of the unity of knowledge. It seems to me that information and its philosophy have this property and can play this role.

In his discussion of the historical origins of the PI, Floridi indicates that the early ascription of transdisciplinarity, as opposed to interdisciplinarity, was considered something negative:

> PI was perceived to be transdisciplinary like cybernetics or semiotics, rather than interdisciplinary like biochemistry or cognitive science. [...] Even if PI had not been too premature or allegedly so transdisciplinary, the philosophical and scientific communities at large were not yet ready to appreciate its importance.

Floridi concentrated on the philosophy of information non-meta-theoretically, but from the perspective of Logic in Reality, there is no need to see metatheoretical and phenomenological, conceptual and physical approaches as totally mutually exclusive. One focuses alternately on one or the other, without conflation. Because information is a multi-level phenomenon, the philosophical study of information can be made at the level of metaphilosophy, as a branch of philosophy, but also at the level of general theory, and even at the general level of technology and engineering applications, as discussed in Wu's book of 1989 [Wu89] *The Philosophy of Information − a New Spirit of the Times* (cf. further discussion in 9.3 below).

In the Foundations of Information Science initiative, Marijuan [Mar09] suggests that rather than the outcome of a single, particularized conceptual discussion, "information becomes the intellectual adventure of developing a 'vertical' or 'transdisciplinary' science connecting the different threads and scales of informational processes, which demands both a *unifying* and *multi-perspective* approach". Similarly, in their work on the dialectics of the socio-technological world, Hofkirchner, Fuchs and their colleagues have defined [Hof07] the context into which any advances in ethical theory and practice must be made as transdisciplinary. In the object-meta-level framework of LIR, a theory and the objects of the theory cannot be totally separate, and include the study of the relationship between the different disciplines as one of those objects.

Now that through the work of Wu, Hofkirchner, Marijuan, Floridi and others a disciplinary status has been achieved for the Philosophy of Information, Information Science and the informational approach to its key domains that they deserve, we suggest that the inter- and transdisciplinary aspects of information and its philosophy can be discussed more productively than was perhaps possible at their inception. As we have seen in Wu's concept of "multi-dimensionality" and will see in the next section on the Metaphilosophy of Information, there is no serious intellectual discipline in which the operation of information is absent or inessential. The Metaphilosophy of Information is thus a transdiscipline[1] *par excellence.*

9. Information – Metaphilosophy and Metalogic

Two major elements have been lacking in current theories and philosophies of information: 1) a classificatory structural ontology of information as a phenomenon and 2) a rigorous picture of the dynamic evolution of information processes and activities. As we have seen in this paper, Wu Kun's Basic Theory of the Philosophy of Information provides a unified system of philosophy, incorporating in its philosophical system the above two aspects in a systematic theoretical framework. Part of his motivation for considering his BTPI as a Metaphilosophy is that it has major implications for philosophy as such.

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[1] A term defined in a 2011 special issue of *triple-C*, "ICTs and society: A transdiscipline?".

9.1. Metaphilosophy and LIR

An apparently simple and non-controversial definition of metaphilosophy is that of a statement or set of statements about philosophy. One such statement, by Sellars, is that "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". An obvious consequence is that a discussion of metaphilosophy requires a definition of philosophy itself. However, a satisfactory basis is often missing in metaphilosophical reflections for both their metaphysical and epistemological dynamics, that is, from where do the properties of things come that enable both them and their descriptions to contrast, to conflict and ultimately to "hang together". Brenner has proposed such a basis [Bre08a], namely, an interpretation of metaphilosophy as referring to the relations between *both* philosophical concepts and theories and between the elements or data of those theories.

The designation of a system of thought as a "meta-" system is not a simple categorization. There is a certain esthetic charm involved in studying the element between the meta and non-meta that goes "beyond research", making it possible to explore the essential meaning of "beyond" in a human context. Most interpretations of metaphilosophy as the philosophy of philosophy accept that the boundaries between the two levels are fuzzy and that the self-reference involves recursion between levels or domains of study. The recursive relation between philosophy and metaphilosophy should mean above all that no aspect of one is totally devoid of aspects of the other and any absolute division into first- and second-order problems is arbitrary. LIR offers a dialectical view of the fundamental metaphilosophical principle that two, dichotomous elements may, in some cases, give rise to a third one. The picture thus develops of a metaphilosophical distinction between entities, including theories, in terms of levels of complexity or some other parameter.

The epistemology of LIR eliminates the problem of a potential infinite regress of 'philosophies'. Iterations, in this case of *real* relations, stop 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.

9.2. Logic in Reality as metalogic

Logic in Reality [Bre08], as should be clear by now, is a new way of 'doing logic' that is much more radical than any changes in the established linguistic schemas of standard logics and any corresponding set or category theory using a standard object-property terminology. This is a metalogical consideration, since it concerns the content and logic of logic itself and what phenomena a logic can describe.

The metalogical properties of a logic as a system of reasoning about propositions, capable of formalization in a symbolic language, are usually considered to be their completeness, compactness and soundness, among others. (Whether or not consistency is still an accepted metalogical principle has become, however, a matter of predilection with the advent of paraconsistent logics.) Metalogical properties are usually couched in a meta-language, which can be ordinary mathematical English, augmented by some metalinguistic symbols, in which accounts of the validity of inferences made in the formal language of the logic, the object language, are given. In comparing, for example, the foundations of two-valued logic with unrestricted acceptance of the principle of bivalence with the three-valued logic of Lukasciewicz, the number of values is a metalogical principle. In LIR, it is not only the *number* of values that is metalogical, but also their properties as properties of real processes.

The metalogical properties of LIR are thus of an entirely different kind, since it is 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, and this principle fits completely Wu's Metaphilosophy of Information.

9.3. The metaphilosophy of information

As early as 1989, Wu Kun had proposed the Philosophy of Information (PI) as a highest philosophy and metaphilosophy of nature, since there is no single field of philosophy or science which is not present in it. At that time, Wu considered that at a metaphilosophical level, the priority for research in the philosophy of information should be given to the following problem areas: the philosophy or philosophical aspects of the essence, shape and form of information; its grades and measures; its ontology, epistemology and methodology; sociology, psychology, esthetics, theory of value; an information theory of evolution and holographic phenomena, and many other areas.

In Wu's words, information science leads in essence to a scientific paradigm of transformation of theory and method, and this transformation can lead to information theory as the dominant mode for understanding the current scientific system [Wu95]. The Philosophy of Information is the highest level of discipline of contemporary information science, and, in the same way as the development of contemporary philosophy, provides a new philosophical paradigm. The Philosophy of Information sees information as a generalized mode of existence, a mode of understanding, and a scale of values, whose evolutionary principles can be explored. From the corresponding metaphilosophical perspective a new information ontology, information epistemology, information theory of production, information society theory, information theory of value, information methodology, information theory of evolution, *etc.* can be constructed. "The Philosophy of Information" is a thus a metaphilosophy, a highest philosophy different from all other philosophy, with the potential for replacing many forms of traditional philosophy [Wu03].

The metalogic of Logic in Reality as a framework, combined with Wu's metaphilosophy of information, justifies what we consider such necessary amendments to the basic concepts of philosophy, ontology and epistemology. The new ways of partitioning ontological theory that can be made using an informational approach and the areas of existence proposed for the dialectic development of opposing factors suggest new modes of philosophical expression.

We wish to emphasize, however, that the joint theory of the philosophy and logic of information presented here is by no means to be considered as a "Theory of Everything". We just want to point out that we put forward this theory to, for all the other research disciplines,

provide a way for their 'recycling' or reconstruction. For example, once accepted the dual existence of matter and information, and their interaction in the dual theory of evolution, all aspects of philosophy and science, understanding of mode of existence of things and of research problems in their fields could in part be changed. A theoretical basis would be available through the metaphilosophy of information, as well as information science and information technology, to help increase levels of ethical responsibility.

10. Conclusions. Informational thinking and the Informational stance

In this paper, we have presented an overview of the Basic Theory of the Philosophy of Information (BTPI) of Wu Kun [Wu10] and an interpretation of it according to the dialectical principles of the Logic in Reality (LIR). Our major conclusion is that LIR provides a logical explanation and justification of the critical concepts of the BTPI:

- A new mode of segmentation of the existence field.
- Information and quality; energy as related to the independence of meaning.
- The principle of the dual existence and dual evolution of energy and information.
- The multi-level informational features of human knowledge.
- Information and its interactions as the source of human values and the basis for human and social development.

LIR supports the BTPI in its designation of the Philosophy of Information as a Metaphilosophy; LIR confirms the reality of the non-separability of the critical elements in a process view of man and nature from both a philosophical and scientific standpoint: subject and object, internal and external, individual and group, and so on.

The BTPI is a Metaphilosophy of Information, as it subsumes and provides an ontological basis for an entire range of types of philosophies of information. LIR, as a Metalogic confers an entirely new function on logic of describing the dynamic evolution of processes, and provides the metaphysical basis for the description of that evolution in informational terms.

We believe that the foundational philosophical theory of information and LIR are clearly interdisciplinary and transdisciplinary, because they provide the ability for sharing of disciplinary perspectives on all the prop-

erties of information, and also provide their own unique level of theory construction beyond these disciplines, namely on the general nature and laws of things, the nature of humans and human society, and values and ethical dimensions that involve a new world view of the existence and functions of information. In our view, to look at information from a transdisciplinary perspective is an integral part of what Wu Kun has referred to as Informational Thinking.

10.1. The methodology of 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.

In this sense, all of the cognitive issues described in this paper, up to and including 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 1) and 2) 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 we 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 systems described in this paper, it is not an "easy" exercise. Be that as it may, Wu and Brenner believe that we are close to a new scientific (and logical) paradigm where Informational Thinking, as opposed to thinking in terms of entities or dynamic systems alone, results in new interpretations of,

among other things, traditional disciplines and their theories. Above all, we consider that our information metaphilosophy and metalogic have contributed to the completion of a scientific theory of information processes as part of a global change in science and philosophy. In other terms, 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, to explain a new dimension of all complex natural and social process activities involved in information.

Through research in the most fundamental areas of the existence and different forms of information, a Philosophy of Information can construct a new scientific and philosophical paradigm. Such a fundamental change in paradigm from the basic question of the philosophy of methods of interpretation can thus, as a metaphilosophy, fundamentally change the current system and structure of philosophy, as well as the philosophical mode of thinking, metaphysical, epistemological and ontological. 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" [He08].

10.2. The informational stance

We believe that the approaches that what we have proposed in this paper describe an *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 is an attitude that requires attention to the informational aspects of complex processes as a methodological necessity, starting from the level of an existence theory for information and a methodology for its investigation (compare [Sag09]). Especially, the Informational Stance supports and generalizes the recent work of leaders in the area of information ethics, including Floridi, Capurro and Wu himself, grounding the attribution of ethical value to all existence in informational terms.

Finally, we have proposed a *philosophical* structure of information that is compatible with its dynamic physical and logical structure. This

has involved a new synthesis of Wu's Philosophy of Information and Logic in Reality that has no obvious direct precursor, either in- or outside of the field of information. We conclude that the combination of the Wu and Brenner theories could be a useful new contribution to resolving critical outstanding issues in the field of information.

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Wu Kun
International Center for the Philosophy of Information
Xi'An Jiaotong University, Xi'An, China
wukun@mail.xjtu.edu.cn

Joseph E. Brenner
International Center for Transdisciplinary Research, Paris (CIRET)
P.O. Box 235
CH-1865 Les Diablerets, Switzerland
joe.brenner@bluewin.ch