ON INFORMATION AND THE GEOGRAPHICAL INTEGRATION OF INFORMATION PROCESSES

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ABSTRACT. ***This paper focuses on the concept of information, proposing an inquiry into its nature and classification, and highlighting the challenge of applying research tools that are incorporated in the object of investigation. The role of metaphor in cognitive processes, as well as those of transdisciplinarity, complexity science, and unifying approaches in modern science and philosophy, from the Digital Earth initiative to Biocosmology, are discussed in an information dynamics perspective. In this context, geography is regarded and substantiated as a suitable foundation for advancing towards an integrated approach to our global environment, to "the whole" as seen from different perspectives, based on a variety of domains, smoothly weaved together. A special place is devoted to Aristotle's organicism, considered as a source capable of nourishing the generation of novel spaces – spaces in which we might see, identify, and connect with reality on levels which seem unattainable under the current episteme.***

KEYWORDS. ***Information, metaphor, transdisciplinarity, integrative systems, geography, Digital Earth, science of complexity, Aristotle, holistic approaches, "world-as-an-organism" worldview, Biocosmology.***

1. Disentangling information

Information. Perhaps never in the history of humanity has a concept been so widely used and so little understood. Investigating its nature is more difficult and hazardous than most of us would tend to admit. There are several reasons for the intricacy and awkwardness of such a task.

First of all, information is different. Important laws that are well defined in science do not seem to be applicable to information – or at least it is not clear how they should be applied. Conservation laws are just one example. However, the problem is still more challenging: it touches upon the foundations of natural sciences. For example, the relations information has to fundamental concepts such as time and space are strange, to say the least, and clearly distinct from those involving material systems. This appears to be disastrous news for anyone attempting to study information in the usual framework of science. Can a problem get any tougher than that? With information, it probably can.

On the other hand, to investigate information, we have to make use of it. There are not many operations trickier than this one. We cannot simply come with external tools to the study of information. The object of inquiry is embedded in the plan of inquiry; it is incorporated in the methodology; it is part of the process of interpretation, impregnating every step to be taken towards it. In fact, one cannot

"advance" towards information because information is already there. It is as if the patient sneaked into the mind and hands of the surgeon, so that it becomes challenging to tell where the patient actually is. No wonder we are still in a state of confusion concerning seemingly elementary questions about information.

All these challenges have their bright side: they support the idea that well-established frameworks of inquiry are not likely to help. Therefore, at least we know, to some extent, what would *not* work. All we have to do is think fresh. The not-so-good news is that we have no answers to questions such as: Fresh in what way? Based on what? Using what references?

Studying information can thus be perceived as a daunting task – and justifiably so. One way of reacting to the problem is simple: stay away from it. There is, nonetheless, also another option: to admit that we know frightfully little about how to proceed (we can hardly decide even what questions to ask), and still attempt to take some steps. Will they be correct, or at least in the right direction? We may not know now, and this may be the case for a while. We might not have the usual tools to check the paths we build, to assess the network of understanding spawned by such an endeavour. Clearly, this second option may lead to undesirable results, such as emitting embarrassingly incorrect sentences, making wrong inferences, or measuring outcomes with improper instruments. The advantage of this option is that one may still get moving, and produce – due to novel perspectives – some new ways of developing better instruments, designing proper methods; one can then explore the validity of findings later on. All these operations may have to be performed, however, to some extent, like acrobats sometimes work: without a safety net. There is no guarantee regarding the accuracy of each phase of the investigation. It may be the case, nevertheless, that an increasingly dense tapestry of discovered features will support ever safer explorations and more fertile steps in future investigations.

We can notice at this point that the word "information" has already been used many times in the paragraphs above without being defined, and probably without the lack of definition bothering the reader. One might thus presume that the concept does not need additional explanations. In fact, we recognize it as being very familiar, without necessarily agreeing – sometimes not even in broad terms – upon the way in which it is defined. The broad spectrum of its meanings was discussed in other papers (Mokros and Ruben 1991; Sholle 1999; Boisot 1995; von Baeyer 2004; Suteanu 2007, 2010a; Byfield 2007) and I shall not attempt to dissect it here. Suffice it to say that the meanings assigned to, or recognized for "information" are far from overlapping or even being reconcilable. However, considering the title of this article, one cannot address "exploration" without specifying what is being explored. I must – even if prudently – outline the sphere associated with the concept in this paper.

One way of addressing this task consists of asking whether information is not a primary concept, like time and space. For those who choose to adopt this option, the questioning may simply stop here. A less comfortable, but perhaps more fruitful approach may consist of further inquiry regarding, for example, our possibility of distinguishing different categories or levels – or even structure – associated with information, which is something we usually cannot say about time and space

(exceptions from this rule will be discussed later in this paper). In fact, it has been suggested (Suteanu 2010a) that the lack of consensus regarding a rigorous definition of information is not necessarily a sign of immaturity of the disciplines concerned with it: we may inappropriately attach the same label to distinct features or processes. As soon as we admit that there may be subdivisions, we also have to face the challenge of defining the whole set of categories and distinguishing it from everything else. To this end, I will tentatively identify information by what seems to be its broadest property, and state that *information is the non-material component of the world*. The fact that it is different from matter does not make information less real. It is also important to specify that, in this sense, information is objective and "independent of the observer", as understood by Muller (2007, p 5), Landauer (1996), and others. Most scholars holding this view about information call it "physical information". The latter has been studied mainly in three different fields: thermodynamics and statistical mechanics, communication theory, and algorithmic information theory (Muller 2007, p 6).

The temporary status of the definition proposed above stems from an admittedly poor understanding regarding the nature of "non-material" entities: are all of them information, or do they all have information as a substrate? As far as I know, there are no substantial arguments to answer this question, and for the time being I will assume that the (provisional) answer is "yes". Otherwise, the non-material nature of information hardly requires any discussion. It has already been highlighted by the founder of cybernetics, Norbert Wiener (1961, p. 132), who cautiously emphasizes the distinction between matter and energy, on one hand, and information, on the other, using a tautology to underline the special nature of information: "Information is information, not matter or energy"!

With this point settled, sub-categories of the broadly defined concept may be distinguished. First, one can identify information as related to change. Called "information flux" to be distinguished from other forms of information (Suteanu 2007, 2010a), it refers to changes in a state of a system, to processes. *No modification in the state of a system is possible without being attended by corresponding information that specifies the change. No information flux – no change.* There is thus high density information flux in a breaking wave, but a much weaker one in a book – unless the book is subject to change due to mould, for instance. Information flux and its density have been defined, for elementary situations, in quantitative terms (Suteanu 2010b), always as a function of scale. Referring only to change, information flux is never "contained" in a system, but corresponds to the system's transformations.

Another envisaged category is information related to system properties. This is probably closer to the common meaning of information. It is based on the assumption that every material entity is in some way the "carrier" or "trigger" of some information, which, eventually, can be accessed by humans (and not only – see, for example, Deely 1990). We can call this category "descriptive information". It is mainly to this category that Muller's definition of information seems to refer: "information consists of any attributes that can determine, even partially, the state of

an object." (Muller 2007, p. 5)

On a different level, we should perhaps indentify a category comprising the laws that govern processes in the material world. This meaning has been approached by Mihai Draganescu (1997, p. 37), the designer of a grand model concerning the role of information in the material world, who even posits a "law formation zone".

All the types of information proposed above concern the direct relation of information to the material world. Probably many other categories can also be distinguished, including mental constructs, various forms of creation, etc. I shall refrain from delving deeper into the topic of information classification, a problem that deserves special treatment, and which would have much to gain from a detailed discussion of Aristotle's ideas (see, for instance, book Zeta of his Metaphysics).

Information is arguably the most dynamic realm we know. No change in the material world, no process can occur without the corresponding information specifying the change. Human action on different levels crucially depends on the way information is acquired, interpreted, processed, communicated. Given the all-pervading nature of information, its better understanding would provide a powerful support to initiatives directed to a much-needed shift towards a holistic worldview. We will probably soon be able to confirm that all forms of information share key properties, and that we only begin to understand them and their relation to various relevant processes. One cannot help echoing the feeling of urgency expressed by David Bohm (1983) concerning the need for such an endeavour. In fact, a vast change in our approach to ourselves and the world as envisaged by newer paradigms such as Biocosmology (Khroutski 2010a, 2010b) would be particularly difficult (if at all thinkable) without boldly exploring the nature and role of information.

2. Weaving information

In such an exploration, it is not uncommon to use a powerful vehicle, which, according to many, can also be dangerous: metaphor. The effectiveness of metaphors extends far beyond the realms of arts. Philosophy, or even science, for example, would probably not exist – at least not in the form in which we know them – if it were not for the insightful use of metaphors. Sometimes metaphors are applied as means to convey ideas that otherwise seem dry and hard to understand; sometimes they are employed from the very beginning by those who break new ground, as tools for exploration. The role of the metaphor in exploration is suggested by its definition as a device meant "to carry over", to facilitate transfer – a transfer of meaning at first, of course, but eventually the transfer of the reader (Hawkes 1972, p. 10) in what can be imagined as information space. Its effect is beautifully emphasized by Aristotle (*Rhetoric* III, 1410b): "Strange words simply puzzle us; ordinary words convey only what we know already; it is from metaphor that we can best get hold of something fresh."

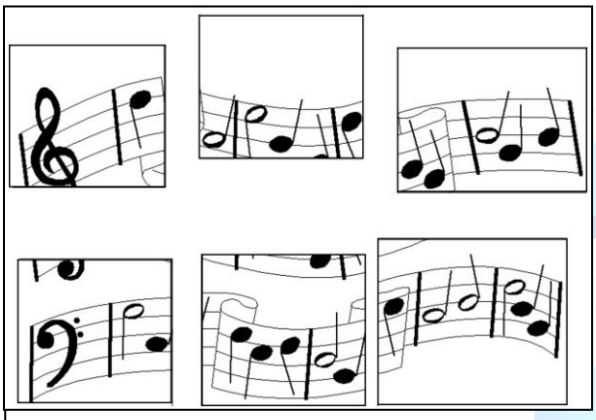

Figure 1. The puzzle metaphor

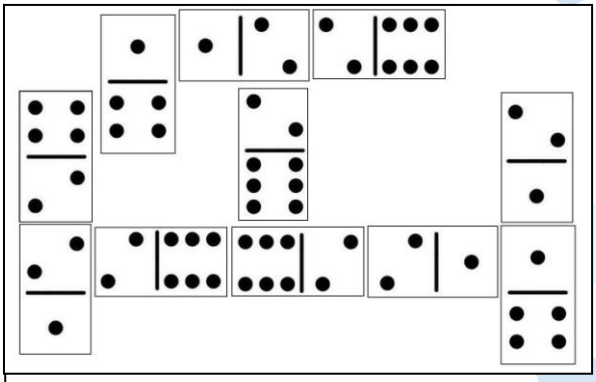

Figure 2. The domino metaphor

Traditional societies effectively used this vehicle in their exploration: however, their space was, typically, much less fragmented than ours (Anyanwu 1987); their experience mostly referred to a coherent ensemble of realms organically articulated, effortlessly encompassing humans and their living and non-living environments, both material and non-material (Eliade 1952, 1957, 1963). Their heroes were able to experience the "state of the boundary" – where different realms get to touch each other and where one is expected to assimilate and experience both realms concomitantly (Cheng 1989, p. 43). Access to a different level of reality does not take place by leaving behind one's personal existence, but by vastly enlarging one's existential horizon, which offers the opportunity of self-transformation in a space of relationships (Torrance 1994, p. 283–291). Instead of an unending set of edges belonging to fragments in a pulverized worldview, a realm of the boundary naturally emerges through integrative thinking and a different way of being in the world (Soyinka 1978). Relations are recognized as more than just meaningful components of human life: they are conditions of survival. "Im Anfang ist die Beziehung" (in the beginning, there is the relationship) says Buber (1923, p. 44).

Nowadays, one of the common metaphors consists of the jig-saw puzzle. It suggests that our knowledge advances through the discovery of pieces of a huge game of puzzle, which, when added to the existing ones, help the construction of the "picture" (Figure 1). The puzzle metaphor has the great merit of reflecting well the fragmented, piecemeal approach that is typical of much of our scientific endeavour (see Bohm, 1983, for a profound discussion on intellectual fragmentation and its deep implications). It justifies the fragmented nature of our knowledge-discovery process, by implying that the resulting pieces of separate inquiries are, eventually, simply put together, and this leads to an understanding of a larger piece of reality. It is true that metaphors should not be judged for their accuracy, but rather for their power to provide energy to the seekers and to guide their search. However, metaphors can be misleading. This seems to be the case here. For example, it suggests that there is one and one way only in which pieces can be put together – there is always a "right" view, all the others being wrong. Also, if pieces fit satisfactorily together, they will stay thus – forever: the only change that may occur in time is the extension of the existing puzzle. This is deceptive. There is not one single, final way of building the desired "picture". Many different paths of discovery may be taken, and these paths can circumscribe our subject in various ways. We are not looking for missing "pieces

of puzzle" to form static pictures; our discoveries may – and often do – require the rearrangement of a large portion of the existing image.

Instead of the puzzle metaphor we can apply another one, more dynamic and probably more applicable: the dominoes metaphor (Figure 2). This time, images can be gradually developed based on small elements, in a given context, based, indeed, on rules that restrict the manner in which pieces can be added to existing ones. However, this can happen in many different ways. At some point (depending on the rules of the game), we may even realize that the existing arrangement is not right and reorganize the pieces according to new insights. Some pieces may be identified as imperfectly fitting in their neighbourhood, but they may be left as such until better arrangements are found. Overall, there is no perfect, completed picture, not even in a single discipline or on one topic.

This metaphor could become more effective if we added different layers and spatial directions in which the configuration would grow, and thus address the challenges from different perspectives, involving several "disciplines". We know very well now that wisely involving different disciplines in the study of complex problems is remarkably effective (Dogan and Pahre 1990; Dogan 1994; Suteanu 2005). Among the way distinct disciplines can contribute to the effectiveness of exploration, probably transdisciplinarity – as defined by Basarab Nicolescu (2008) – is the most advanced one. Unlike multidisciplinarity, where results from different independent inquiries are set side-by-side, and interdisciplinarity, which is based on methodological transfer among disciplines and enhanced cross-boundary dialogue, transdisciplinarity is defined by the concentration of efforts from different perspectives on a common goal, a common question. Without giving up any strengths of interdisciplinarity, in this case the actual place – or discipline – from where we look is not emphasized: all strive towards the objective with the aim of applying an integrated effort. With an emphasis on integration, this preoccupation is now part of a large stream regarding "integrative studies" (Szostak 2003, p. 340).

Probably one of the most powerful and fast developing new metaphors concerning knowledge development, integration, access, and application is the one called Digital Earth. Based on Al Gore's vision and initiative (Gore 1999), it is seen "as a framework to harmonise our efforts in the geospatial information realm, and to increase our collective understanding of the state of our planet and the interactions between physical and societal environments on it" (Craglia et al, 2008). I think that the key word in this statement is "harmonise": although remarkable efforts are invested in technology, standards and protocols, etc., the main idea behind Digital Earth is to create an environment to which millions can contribute, and which everybody should be able to access. From schools to cutting edge research teams, all should find relevant information in relevant form. The system should provide seamless exploration of information that is spatially related, refer to a variety of aspects of the sciences – and not only, provide glimpses into the past and projections into the future. Given the diversity of possible "levels" or "territories" of interest, the system would not consist of a rigid body of tightly packed items, but of multiple globes in interconnection (Craglia et al, 2008). One may state – without fear of

exaggeration – that the Digital Earth concept can create premises for a new integration of knowledge, based on transdisciplinary collaboration.

The fact that such a unifying approach grows from the field of geography should not be surprising. One of the characteristic traits of geography consists of its intrinsic transdisciplinarity. Not only are there different disciplines represented in the body of geography (forming sub-fields such as biogeography, economic geography, historical geography, cultural geography, etc.): its very methodology relies on an integrated approach to its subject matter based on a variety of domains, smoothly weaved together, typically aiming at an understanding of "the whole" as seen from different perspectives. It effectively identifies and evaluates relationships among different levels of the studied systems, and readily handles quantitative as well as – and often together with – non-quantifiable information. In fact, explicitly or implicitly, geography is a discipline that has the preoccupation for information handling at its core. Due to Digital Earth, steps towards a long-awaited restoration of unity of knowledge seem to be starting from the field of geography. What is even more intriguing, Digital Earth may become a potential host for other disciplines: thereby, this initiative may represent fertile ground and seeds for information organization in other fields of knowledge.

The almost organic growth of Digital Earth would have much to gain from the support from other fruit of the end of the last millennium, collectively known as the "science of complexity". One of the main traits of the latter is its unifying character, which suddenly and unexpectedly provided numerous fertile bridges among otherwise distinct or even remote disciplines (non-technical but insightful accounts of this effervescent domain are offered by scholars such as Peitgen et al 1992, and Bak 1999, among others). Not only is this approach to science tremendously effective in the most different branches of human inquiry, but it is at the same time a generator of rich and fresh philosophical insights (Mainzer 1993). It was not by accident that the science of complexity had roots embedded in the realm of geography. Whether one starts from patterns of irregular coastlines or the sensitive dependence of atmospheric variables on initial conditions, key domains such as fractal mathematics and chaos theory found essential triggers in questions concerning geographical problems and physical processes on Earth, on different scales in space and in time. The unifying power of the principles and methods of complexity science has not been adopted in geography as an external asset, but rather grew from within it, thus contributing to the effectiveness of geography in the study of information processes. Geographical subjects ideally lend themselves to analyses involving not only one scale or several scales, but whole domains in scale space, for which complexity science has developed dedicated approaches. Indeed, information processes can be effectively explored in a multiscalar context (Suteanu 2010b). Geography also represents a fruitful domain for the emergence and growth of holistic views. Some of the most meaningful advances in science strongly resonate with Aristotle's whole seen as an organism and his recognition of change as an essential aspect of the world. In fact, complexity science often encourages an attention shift from structures and systems to processes, to change. One of the main scientific contributions to this direction of

research was provided by Prigogine, the founder of far-from-equlibrium thermodynamics and discoverer of the dynamics and role of dissipative structures, for which he was awarded the Nobel Prize in 1977. Insisting on the importance of irreversible processes and the meaningfulness of the "arrow of time", he reveals key properties of instabilities and their implications for the systems' sensitive dependence on initial conditions – and thereby, for determinism. In a book co-authored with Isabelle Stengers, a conclusion is reached that would have been difficult to envisage not more than a couple of decades earlier: "The more we know about our universe, the more difficult it becomes to believe in determinism" (Prigogine and Stengers, 1997). This approach to science leads to the identification of meanings of space and time able to restore to science the philosophical dimension it deserved (Bohm, 1983). Not only are there different categories of time found in system dynamics (Prigogine, 1981, p. 205), but even space becomes significantly marked by asymmetries and inhomogeneities that have a large impact on the behavior of nonlinear systems; according to Prigogine and Stengers (1984, p. 171), "we move from Euclidian to Aristotelian space". In fact, in a wider sense, Prigogine's position "corresponds to the Aristotelian way of thinking: the world is cognized as a big living organism containing the humans" (Näpinan 2002, p. 120).

Interestingly, the Digital Earth initiative did not start from theoretical principles regarding the need for an organic view, and not even from questions arising from complexity science: it was triggered by the finding that a huge and fast increasing quantity of information collected by humans has never been used – and not even seen – by anybody; this stands in sharp contrast with the multiple crises and problems we need to address on our planet (Gore 1999). The overwhelming stream of information – in terms of both quantity and diversity – is real, and more challenging that most of us would think (Klingberg 2009), but the solution to the problem does not consist of collecting less and less information. On the contrary, the current tendency in science is to acquire ever larger quantities of increasingly diverse information. The "overflow" effect is accelerating. A solution to this challenge is to produce an *information volume collapse* by discovering the links between the different pieces of information, integrating the fragments in coherent systems, making sense of the "whole". In fact, "understanding is compression of information" (Dodig-Crnkovic 2007, p 264). In an informational environment, integration can make a significant difference (Balduzzi and Tononi 2009, p. 2). Such integration is precisely what Digital Earth proposes to produce. We can thus witness an integration effort reached not as a conclusion of philosophical inquiries, but as a pragmatic consequence of real-world practical challenges.

It is noteworthy that paradigms that seem to be independent from each other propose holistic approaches to the understanding of the world. For example, the Gaia hypothesis, initiated by Lovelock (1979, 1990) and further developed by him and other scholars, comes very close to the "world-as-an-organism" worldview. It refers mainly to our planet, rather than the world as a whole, but highlights and proposes ways to overcome significant limitations in our current mentality and scientific practice. As Flannery (2006, p. 17) points out, who adheres to the Gaia theory "sees

everything on Earth as being intimately connected to everything else, just as organs are in a body. […] As a result, a Gaian worldview predisposes its adherents to sustainable ways of living. In our modern world, however, the reductionist worldview is in the ascendant, and its adherents often see human actions in isolation." The Gaia hypothesis has quickly evolved and spread, and currently involves numerous scientists and important organizations. Based on four large international research programs, the Earth System Science Partnership (ESSP) was formed in 2001 with the aim of establishing an integrated approach to planetary dynamics, and specifically to "global environmental change". Importantly, the project includes both natural and social sciences, and strives to not only reach a better understanding of our changing environment and the role we play in the process, but also to support effective policies (Leemans et al 2009).

While the Digital Earth initiative is focusing on ways of integrating knowledge and information-focused processes, the ESSP strategy proposes scientific approaches considering the actual complexity of planetary processes, on different scales and in different fields. They both include advances in both the natural and the social sciences, and both have as an objective a better understanding of our planet and attaining sustainability. An integration of these two large projects, Digital Earth and the Earth System Science Partnership, may synergically advance towards outcomes that were not just unthinkable not long ago, but may even go as far as being able to effectively address some of the crucial problems we are facing today.

Notwithstanding the merits of projects like those discussed above, it is a wholly different type of integration that some scholars think is needed: one meant not to emulate an idealized past, but to reveal the consciousness of unity that starts in our thoughts, and reaches a coherent picture of us and the cosmos together. Not as mystical experience, but as genuinely rational clarity that enables us to overcome endless fragmentation, contradiction, and self-inflicting confusion (Bohm 1994). However, Bohm's (1994) rays of hope are subject to merciless filtering through current mentalities, which often allow little else than concerned nodding. This extraordinary scholar has not offered an easy-to-assimilate philosophical system, and even less so did he set forth concrete paths for stepwise achievement of such challenging goals. Nevertheless, proposals for other integrative systems are emerging. Biocosmology (Khroutski 2003, 2010b) not only goes deep in the process of identifying challenges, goals, and methods, but also advances all the way to the level of concrete implications. It is not limited to the sciences, and not even to an integration of methods in a broader sense (notwithstanding the huge proportions of such an endeavor alone) or to a certain spatial extent – such as our planet. Starting from the premise of a common, universal essence of all organic processes, it is founded on a worldview in which humans define their place in a cosmos seen as an integrated whole, with which they have interactions on all scales according to fundamental, universal principles. Based on Aristotle's philosophy with its original sense restored (as opposed to the theological sense conveyed to Aristotle in the Middle Ages), Biocosmology highlights the philosopher's organic view of the world, a world with a differentiated structure in which each part has a meaning and plays a

specific role, as opposed to one in which disparate factors interact mechanistically in a homogeneous environment. It is not the goal of this paper to provide an outline of Biocosmology – to appreciate its richness and value, one is advised to refer to the actual sources (Khroutski 2003, 2004, 2006, 2008, 2010a, 2010b). However, even such a glimpse can show to what extent this system resonates with principles of nonlinear science, as spelled out by Prigogine, for instance.

There appears to be a stark contrast between the subtlety and philosophical elevation of Biocosmology, and the detailed, well-thought out Digital Earth framework with its flexible and immediate practical applicability. However, both make us think (unless "dream" would be the more appropriate term) of an organically integrating and naturally developing context, in which knowledge would be breathed in, breathed out, transformed according to the metabolism of members of the huge information community. We may still be farther than we thought from such a paradigm [or *episteme*, as Khroutski (2010a) would probably put it, because of its broader meaning, reaching beyond the realm of science in which *paradigm* was insightfully introduced by Kuhn].

Nevertheless, one can still explore possible paths towards remote aims. One may ask, for instance, what is the most critically important feature such a context must have, should we have the will, coherence, and capacity of building it. If I would have to mention only one crucial aspect of the new fundamental edifice, I would choose accessibility to change. We should be aware of the current (and future) limitations of our understanding, which will persist, no matter how much we learn and how much we discover. Doing otherwise would mean more than just embarrassingly waving our presentism as it is often the case today (Khroutski 2006). Every rigid framework will have to be overcome by an organically growing world, and thus the framework should be prepared – as much as possible – for the process of change and growth, probably occurring in many unexpected ways. We may thus want to make the integrative system supple and modifiable. But wouldn't this happen under the auspices of a certain episteme, and if so, which one should it be? The richness of the world is always higher than any individual or group can imagine. Nobody can foresee the infinite diversity of paths that will emerge tomorrow. What one can aspire to do, however, is create mechanisms that would allow the edifice to grow, without cracking due to pressure that cannot be accommodated; wisely avoid the stating (or even imposing) of "standardized" views (Jin …); shun assumptions of "eternal" validity of today's perspectives. We know too well how valuable participant diversity can be to information processes – from discovery to understanding and design. In the spirit of the dominoes metaphor, accommodating paths grown from a variety of views, freely and flexibly integrated in knowledge space, is essential.

It is true that we may still be far from able (in many cases, even from attempting) to move beyond long-lasting boundaries that keep human beings compartmentalized and incapable of recognizing the whole they epitomize in and together with their environment. An emerging science of information is expected to help us transcend the limitations in vision that hold us in a state of fragmentation, conflict and confusion. Understanding the properties of information and the processes

in which it is – and we are – involved may offer us a new chance; a chance of advancing in a way that would make us "not merely endure", but "prevail" – as Faulkner confidently asserted. Addressing a different context, Dodds (1951, p. 254–255) noticed a situation to which we can draw an intriguing parallel: the awareness of an approaching challenge, for which we may not be sure if we are prepared. "What is the meaning of this recoil, this doubt?" he asks. "Is it the hesitation before the jump, or the beginning of a panic flight?" He reminds us that "once before a civilized people rode to this jump – rode to it and refused it. […] Was it the horse that refused, or the rider?". And as if he spoke about the current developments regarding information processes and the way we are starting to decipher them, Dodds continues with the same optimism shown by Faulkner: "Modern man, on the other hand, is beginning to acquire such an instrument. It is still far from perfect, nor is it skilfully handled. […] Yet it seems to offer the hope that if we use it wisely we shall eventually understand our horse better; that, understanding him better, we shall be able by better training to overcome his fears; and that through the overcoming of fear horse and rider will one day take that decisive jump, and take it successfully."

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