

LEVELS OF REALITY AND THE SACRED*

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1. Introduction

The dialogue between science and ontology seems to be, at first sight, an impossible one. This impossibility is clearly seen when one contemplates the three postulates of modern physics as formulated by Galileo Galilei in *Dialogue on the Great World Systems* [1]:

1. *There are universal laws, of a mathematical character.*
2. *These laws can be discovered by scientific experiment.*
3. *Such experiments can be perfectly replicated.*

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In particular, it should be obvious that if we try to built a mathematical bridge between science and ontology, we will necessarily fail. Galileo himself makes the distinction between human mathematics and divine mathematics. Human mathematics constitutes, he says (through Salvati), the common language of human beings and God, while divine mathematics is connected with the direct perception of the totality of all existing laws and phenomena. A new scientific, cultural and spiritual approach - *transdisciplinarity* - tries to take this distinction into account seriously. A bridge can be built between science and ontology only by taking into account the totality of human knowledge.

KNOWLEDGE DK	KNOWLEDGE TK
<i>IN VITRO</i>	<i>IN VIVO</i>
External world - Object	Correspondence between external world (Object) and internal world (Subject)
knowledge	understanding
analytic intelligence	new type of intelligence - harmony between mind, feelings and body
oriented towards power and possession	oriented towards astonishment and sharing

binary logic	included middle logic
exclusion of values	inclusion of values

Table 1. Comparison between disciplinary knowledge **DK** and transdisciplinary knowledge **TK**.

As the prefix “trans” indicates, *transdisciplinarity concerns that which is at once between the disciplines, across the different disciplines, and beyond all disciplines*. Its goal is the understanding of today's world, of which one of the imperatives is the unity of knowledge. The word itself is quite recent: it was first introduced by Jean Piaget in 1970. Transdisciplinary research is clearly distinct from disciplinary research, even though it is entirely complementary to it. Disciplinary research is concerned with, at most, one and the same level of Reality; and, in most cases, with only fragments of that one level of Reality. In contrast, transdisciplinarity is concerned with the dynamics generated by the interaction of several levels of Reality at once. The discovery of these dynamics necessarily begins with thorough understanding of disciplinary knowledge. Transdisciplinary knowledge **TK**, corresponds to a new type of knowledge - *in vivo* knowledge. This new knowledge is concerned with the correspondence between the external world of the Object and the internal world of the Subject. By definition, **TK** knowledge includes a system of values (see Table I). It is important to realize that disciplinary knowledge and transdisciplinary knowledge are not antagonistic but complementary. Both their methodologies are founded on a fully scientific attitude.

2. The transdisciplinary approach to Nature and knowledge

I described the methodology of transdisciplinarity in my book *Manifesto of Transdisciplinarity*, just published by State University of New York (SUNY) Press [2]. This methodology is founded on three postulates:

- i. *There are, in Nature and in our knowledge of Nature, different levels of Reality and, correspondingly, different levels of perception.*
- ii. *The passage from one level of Reality to another is governed by the logic of the included middle.*
- iii. *The structure of the the totality of levels of Reality or perception is a complex structure : every level is what it is because all the levels exist at the same time.*

The first two postulates have received experimental evidence from quantum physics, while we find evidence for the last one not only in quantum physics but also in a variety of other exact and human sciences. However transdisciplinarity is not premised on a transfer from modern science : this would be a false epistemological and philosophical procedure. Modern science, in its most general aspects, allows us to identify the three postulates of transdisciplinarity, but once they are formulated, they have a much wider validity than in modern science itself, especially in the field of education and of culture.

The transdisciplinary approach to Nature and knowledge can be described through the diagram shown in Fig. 1.

In the left part are symbolically drawn the levels of Reality

$$\{ NR_n, \dots, NR_2, NR_1, NR_0, NR_{-1}, NR_{-2}, \dots, NR_{-n} \}$$

The index n can be finite or infinite.

The meaning we give here to the word “reality” is pragmatic and ontological at the same time.

By “Reality” (with a capital “R”) we intend first of all to designate that which resists our experience, representations, descriptions, images, or even mathematical formulations.

Insofar as Nature participates in the being of the world, one must give an ontological dimension to the concept of Reality. Reality is not merely a social construction, the consensus of a collectivity, or some intersubjective agreement. It also has a trans-subjective dimension : e.g. experimental data can ruin the most beautiful scientific theory.

By “level of Reality”, a notion I first introduced in Ref. 3 and later developed in Refs. 4, I designate a set of systems which are invariant under certain laws : for example, quantum entities are governed by quantum laws, which represent a radical departure from the laws of the classical world. That is to say that two levels of Reality are different if, when passing from one to the other, there is a break in the applicable laws and a break in fundamental concepts (like, for example, causality).

The emergence of at least three different levels of Reality in the study of natural systems — the macrophysical level, the microphysical level and cyber-space-time (to which one might add a fourth level - that of the M-theory in particle physics, unifying all physical interactions and which has, for the moment, only a pure speculative status) — is a major event in the history of knowledge. The existence of different levels of Reality has been affirmed by different traditions and civilizations, but this affirmation was founded only on the exploration of the interior universe of human beings.

Two adjacent levels (say, NR_0 and NR_1 in Fig. 1) are connected by the logic of the included middle, which differs from classical logic in the following essential way.

Classical logic is founded on three axioms :

1. *The axiom of identity* : A is A.
2. *The axiom of non-contradiction* : A is not non-A.
3. *The axiom of the excluded middle* : There exists no third term T (“T” from “third”) which is at the same time A and non-A.

In the framework of classical logic, one immediately arrives at the conclusion that the pairs of contradictories advanced by quantum physics, as a consequence of quantum superposition principle, are mutually exclusive, because one cannot affirm the validity of an assertion and of its opposite at the same time : A and non-A.

Most quantum logics [5] have modified the second axiom of classical logic — the axiom of non-contradiction — by introducing non-contradiction with several truth values in place of the binary pair (A and non-A). Stéphane Lupasco (1900-1988) has shown that the logic of the included middle is a true logic, formalizable and formalized, multivalent (with three values : A, non-A, and T) and non-contradictory [6].

Our understanding of the axiom of the included middle — there exists a third term T which is at the same time A and non-A — is completely clarified once the notion of “levels of Reality” is introduced.

In order to obtain a clear image of the meaning of the included middle, we represent in Fig. 2 the three terms of the new logic — A, non-A, and T — and the dynamics associated with them by a triangle in which one of the vertices is situated at one level of Reality and the two other vertices at another level of Reality. The included middle is in fact an *included third* term [7]. If one remains at a single level of Reality, all phenomena appear to result from the opposition between two contradictory elements. The third dynamic, that of the T-state, is exercised at another level of Reality, where that which had appeared to be disunited is in fact united, and that which had appeared contradictory is perceived as non-contradictory. The included middle gives a natural, coherent and rational understanding of the quantum superposition principle.

The T_1 -state present at the level NR_1 (see Fig. 1) is connected to a pair of contradictories (A_0 and non- A_0) at an immediately adjacent level. The T_1 -state allows the unification of contradictories A_0 and non- A_0 , but this unification takes place at a level different from the one NR_0 on which A_0 and non- A_0 are situated. The axiom of noncontradiction is thereby respected.

The logic of the included middle is capable of describing the coherence among these levels of Reality by an iterative process defined by the following stages: (1) A pair of contradictories (A_0 , non- A_0) situated at a certain level NR_0 of Reality is unified by a T_1 -state situated at a contiguous level NR_1 of Reality; (2) In turn, this T_1 -state is linked to a couple of contradictories (A_1 , non- A_1), situated at its own level; (3) The pair of contradictories (A_1 , non- A_1) is, in its turn, unified by a T_2 -state situated at a third level NR_2 of Reality, immediately contiguous to the level NR_1 where the ternary (A_1 , non- A_1 , T_1) is found. The iterative process continues to indefinitely until all the levels of Reality, known or conceivable, are exhausted.

In other words, the action of the logic of the included middle on the different levels of Reality induces an open structure of the unity of levels of Reality. This structure has considerable consequences for the theory of knowledge because it implies the impossibility of a self-enclosed complete theory. Knowledge is forever *open*.

The open structure of the unity of levels of Reality is in accord with one of the most important scientific results of the twentieth century concerning arithmetic, the Incompleteness Theorems of Kurt Gödel [8], which state that a sufficiently rich system of axioms inevitably leads to results which are either undecidable or contradictory. The implications of Gödel's theorems have considerable importance for all modern theories of knowledge, primarily because they concern not just the field of arithmetic, but all of mathematics which includes arithmetic. I fully agree with the mathematician Cristian S. Calude who recently stated that: "Gödel's Incompleteness Theorems have the same scientific status as Einstein's principle of relativity, Heisenberg's uncertainty principle, and Watson and Crick's double helix model of DNA" [9].

I am personally convinced that the simultaneous consideration of Gödel's Incompleteness Theorems and of the notion of level of Reality will have far-reaching consequences both in the foundations of both science and culture.

The levels of Reality allow us the possibility of understanding quantum indeterminacy through the action of one level on another level [3, 10]. It is extremely important that Gregory Chaitin showed that, surprisingly, indeterminacy is present even in mathematics [11].

There is a deep connection between Gödel's Incompleteness Theorems, randomness and levels of Reality. Randomness rigorously means absence of laws, order or patterns; it is not perfect disorder, which still corresponds to the presence of laws. We have to face the question: Did the laws always exist or were they born at some moment in the evolution of the universe? The last possibility was very well discussed by the quantum physicist Walter Thirring [12]. It was, in fact, already present in the sixteenth century, in the cosmology of Jacob Boehme [13]. This possibility implies a lot of other questions. Is evolution going towards the increase or the decrease in the number of laws? Are the levels of Reality the empirical signature of this process? Is the incompleteness connected with the structure of our mind and with our incapacity for conceiving wholeness? Or is the incompleteness the result of our tendency of studying a level of Reality as independent of wholeness? Does time have levels corresponding to the different levels of Reality? Do the levels of Reality exhaust all the Reality? Of course, I have no time to discuss all these questions.

In any case, the Gödelian structure of the unity of levels of Reality, associated with the logic of the included middle, implies that it is impossible to construct a complete theory for describing the passage from one level to the other, and, a fortiori, for describing in a complete fashion the unity of levels of Reality. If such unity does exist, this linking of all the levels of Reality must necessarily be an open unity.

There is certainly a coherence among different levels of Reality, at least in the natural world. In fact, an immense self-consistency — a cosmic bootstrap — seems to govern the evolution of the universe, from the infinitely small to the infinitely large, from the infinitely brief to the infinitely long. A flow of information is transmitted in a coherent manner from one level of Reality to another in our physical universe. However, if coherence is limited only to the levels of Reality, it stops both at the “highest” level and at the “lowest” level. If we introduce the idea of a coherence which continues beyond these two

limiting levels, we must conceive the unity of levels of Reality as extending by a zone of *non-resistance* to our experiences, representations, descriptions, images, and mathematical formulations. The “highest” level and the “lowest” level of the totality of levels of Reality are united across a zone of absolute transparency (see Fig. 1). *In this zone there are no levels of Reality.*

Quite simply, the non-resistance of this zone of absolute transparency is due to the limitations of our bodies and of our sense organs — limitations which apply regardless of what measuring tools are and will be used to extend these sense organs. The zone of non-resistance corresponds to *the sacred* — to *that which does not admit of any rationalization.*

It is important to recall the distinction made by Edgar Morin between rational and *rationalisation* [14]. The sacred is rational but not rationalisable.

Of course, one has to distinguish the words "Real" and "Reality". *Real* designates that which is, while *Reality* is connected to resistance in our human experience, as discussed above. The "Real" is, by definition, forever veiled, while "Reality" is accessible to our knowledge. The zone of non-resistance corresponds to the “veil” which Bernard d’Espagnat referred to as “the veil of the Real” [15]. In our terminology the veiled Real is not a level of Reality, because such levels involve resistance.

The problem of the sacred, understood as the presence of something of irreducibly real in the world, is unavoidable for any rational approach to knowledge. One can deny or affirm the presence of the sacred in the world and in ourselves, but some reference to it must be made if a discourse on Reality is to be coherent.

Mircea Eliade once stated in an interview : *“The sacred does not imply belief in God, in gods, or spirits. It is . . . the experience of a reality and the source of consciousness of existing in the world”* [16]. The sacred is first of all an experience ; it is transmitted by a feeling — the “religious” feeling — of that which links beings and things and, in consequence, induces in the very depths of the human being an absolute respect for the others, to whom he or she is linked by their all sharing a common life on one and the same Earth.

A crucial problem today is certainly the relation between the sacred and technoscience as unfortunately revealed yet again by the events of September 11th, 2001.

The germ of the split between science and meaning, between subject and object, was certainly present in the seventeenth century, when the methodology of modern science was formulated, but it did not become fully developed until the nineteenth century.

In our approach, the unity of levels of Reality and its complementary zone of non-resistance constitutes what we call the *transdisciplinary Object*.

A new *Principle of Relativity* [2] emerges from the coexistence between complex plurality and open unity : *no level of Reality constitutes a privileged place from which one is able to understand all the other levels of Reality*. A level of Reality is what it is because all the other levels exist at the same time. This Principle of Relativity can provide a new perspective on the dialogue between different academic disciplines, between cultures and between religions. In the transdisciplinary vision, Reality is not only multidimensional, it is also multireferential.

The different levels of Reality are accessible to human knowledge thanks to the existence of different levels of perception, described diagrammatically at the right of Fig. 1. They are found in a one-to-one correspondence with levels of Reality. These levels of perception

$$\{ NP_n, \dots, NP_2, NP_1, NP_0, NP_{-1}, NP_{-2}, \dots, NP_{-n} \}$$

permit an increasingly general, unifying, encompassing vision of Reality, without ever entirely exhausting it.

As in the case of levels of Reality, the coherence of levels of perception presuppose a zone of non-resistance to perception. *In this zone there are no levels of perception*.

The unity of levels of perception and this complementary zone of non-resistance constitutes what we call the *transdisciplinary Subject*.

The two zones of non-resistance of transdisciplinary Object and Subject must be identical for the transdisciplinary Subject to communicate with the transdisciplinary Object. A flow of consciousness that

cuts coherently across different levels of perception must correspond to the flow of information cutting coherently across different levels of Reality. The two flows are interrelated because they share the same zone of non-resistance. Thus knowledge is *both* exterior and interior.

The open unity between the transdisciplinary Object and the transdisciplinary Subject is conveyed by the coherent orientation of the flow of information, described by the three oriented loops in Fig. 1 which cut through the levels of Reality, and of the flow of consciousness, described by the three oriented loops which cut through the levels of perception.

It is important to note that the three loops of coherence in Fig. 1 are situated not only in the zone where the levels of Reality are absent but also *in between* the levels of Reality: the zone of non-resistance of the sacred penetrates and crosses the levels of Reality. In other words, the transdisciplinary approach to Nature and knowledge offers a *link between the Real and the Reality*.

The loops of information and consciousness must meet in a least one point **X** in order to insure the coherent transmission of information and consciousness everywhere in the Universe. In some sense, the point **X** is the source of all Reality and perception. It reminds us of what Gregory of Nazianzus calls "beyond all and everything".

The point **X** and its associated loops of information and consciousness describe the third term of transdisciplinary knowledge : *the Interaction term between the Subject and the Object, which can be reduced neither to the Object nor to the Subject*.

This ternary partition

{ Subject, Object, Interaction }

is radically different from the binary partition

{ Subject, Object }

which has defined modern metaphysics.

Of course, the Subject - Object problem was central for the philosophical thinking of the founders of quantum mechanics. Pauli, Heisenberg and Bohr, just as Husserl, Heidegger and Cassirer, all refuted

the fundamental axiom of modern metaphysics: the total separation between Subject and Object. This framework also applies to the views I am expressing here.

In fact, Werner Heisenberg came very near to the concept of "level of Reality" in his philosophical writings. In his famous manuscript of 1942 (which was only published in 1984) Heisenberg, who knew Husserl well, introduced the idea of three *regions of reality*, able to give access to the concept of "reality" itself : the first region is that of classical physics, the second — of quantum physics, biology and psychological phenomena and the third — that of the religious, philosophical and artistic experiences [17]. This classification has a subtle ground : the closer and closer connectivity between Subject and Object.

The perception of the sacred is first of all an experience irreducible to any theory. It concerns the silence between words, across words and beyond any word. The space between the levels of perception and the levels of Reality is the space of this silence; it is the equivalent, in interior space, of that which is called the quantum vacuum in exterior space. It is a full silence, structured in levels. There are as many levels of silence as there are correlations between levels of perception and levels of Reality. And beyond all these levels of silence there is another quality of silence, that place without place which the French poet and philosopher Michel Camus calls "our luminous ignorance." [18]. This nucleus of silence appears to us as an unknowable, because it is the unfathomable well of knowledge, but this unknowable is luminous because it illumines the very structure of knowledge. A long time ago, the Dionysius Areopagite spoke, in a similar way, about "the transluminous darkness of silence".

In fact, transdisciplinary knowledge is in agreement with the patristic tradition and, in particular, with the teachings of Dionysius Areopagite and Gregory of Nyssa, because transdisciplinarity represents a modern form of the dialogue between the cataphatic knowledge and the apophatic knowledge. Scientific knowledge is precisely of the cataphatic type. However, as the Greek quantum physicist Argyris Nicolaidis remarked in a talk given at a recent SSQ meeting in Romania [19], Gödel's

Incompleteness Theorems appear as a quite surprising link between cataphatic knowledge and apophatic knowledge.

It is important to recall here the distinction made by the great Romanian theologian Dumitru Staniloaie, in his book *The Experience of God in Orthodoxy* [20], between the eastern patristic tradition and the *via negativa* of western theology: for the first, the apophatic theology is a direct experience and not an intellectual negation. In my view, experience reveals itself as a way of knowledge whose omission leads to incompleteness. In fact, there are two types of apophatism: the one which can be experienced but is non-rationalisable and another which is both impossible to experience and non-rationalisable. The two types of apophatism are present in transdisciplinary knowledge. The transdisciplinary dialogue between science and religion could lead to a positive theology, of the kind already sketched in the important book of Philip Clayton *The Problem of God in Modern Thought* [21].

The notion of "levels" itself can be found in christian iconography (e. g. the Jacob's ladder) and also in the teachings of Gregory of Nazianzus. In the case of Gregory of Nazianzus apophatic experience proceeds by degrees, by levels. As Dumitru Staniloaie writes, apophatic knowledge is not irrational but "suprarational" (I would prefer myself the word *transrational*). Transrational and rational knowledge complete each other.

Finally, the consideration of mutually exclusive couples of contradictories (A, non-A) is very evident in the thinking of Gregory of Nyssa, Dionysius Areopagite and Gregory Palamas. For example, when one reads the book *The Divine Names* of Dionysius Areopagite, it is clear that apophatic experience always unifies contradictories by exceeding them. Apophatic knowledge is structurally a knowledge of the included middle. In an extraordinary book, *Between Science and Religion*, the physicist and catholic priest Thierry Magnin has shown the fecundity of the logic of the included middle for the understanding of theological concepts and ideas [22].

Allow me to conclude by showing you the drawing from the treatise *The Ascent of the Mount Carmel* written by Saint John of the Cross in 1581-1585 [23], which presents a stunning analogy with the model of the transdisciplinary Reality shown in Fig. 1. At the right of the drawing we see the way of the "Earth's goods" and it is said that we get lost if we take this way. At the left of the drawing, we find the way of the "Heaven 's goods" and it is said that we get lost also if we take this way. Only the middle way, the one of "Nothing", leads to the summit of the mountain.

NOTES AND REFERENCES

[1] Galileo Galilei, *Dialogue sur les deux grands systèmes du monde*, Seuil, Paris, 1992, translated from the Italian by René Fréreau with the collaboration of François de Gandt, pp. 128-130; *Dialogue on the Great World Systems*, University of Chicago Press, Chicago, 1956, with an introduction by Giorgio de Santillana.

[2] Basarab Nicolescu, *Manifesto of Transdisciplinarity*, translated from the French by Karen-Claire Voss, State University of New York (SUNY) Press, New York, 2002.

[3] Basarab Nicolescu, *Nous, la particule et le monde*, Le Mail, Paris, 1985 ; 2nd edition : Le Rocher, Monaco, Collection "Transdisciplinarité", 2002.

[4] Basarab Nicolescu, *Levels of Complexity and Levels of Reality*, in "The Emergence of Complexity in Mathematics, Physics, Chemistry, and Biology", Proceedings of the Plenary Session of the Pontifical Academy of Sciences, 27-31 October 1992, Casina Pio IV, Vatican, Ed. Pontificia Academia Scientiarum, Vatican City, 1996 (distributed by Princeton University Press), edited by Bernard Pullman;

Basarab Nicolescu, *Gödelian Aspects of Nature and Knowledge*, in "Systems - New Paradigms for the Human Sciences", Walter de Gruyter, Berlin - New York, 1998, edited by Gabriel Altmann and Walter A. Koch;

Michel Camus, Thierry Magnin, Basarab Nicolescu and Karen-Claire Voss, *Levels of Representation and Levels of Reality: Towards an Ontology of Science*, in *The Concept of Nature*

in Science and Theology (part II), Labor et Fides, Geneva, 1998, pp. 94-103, edited by Niels H. Gregersen, Michael W.S. Parsons and Christoph Wassermann;

Basarab Nicolescu, *Hylemorphism, Quantum Physics and Levels of Reality*, in *Aristotle and Contemporary Science*, Vol. I, Peter Lang, New York, 2000, pp. 173-184, edited by Demetra Sfendoni-Mentzou, introduction by Hilary Putnam.

[5] T. A. Brody, *On Quantum Logic*, in *Foundation of Physics*, vol. 14, n° 5, 1984, pp. 409-430.

[6] Stéphane Lupasco, *Le principe d'antagonisme et la logique de l'énergie*, Le Rocher, Paris, 1987 (2nd edition), forward by Basarab Nicolescu ; *Stéphane Lupasco - L'homme et l'oeuvre*, Le Rocher, Monaco, coll. "Transdisciplinarité", 1999, edited by Horia Badescu and Basarab Nicolescu.

[7] The expression "included third" is more precise. However, in order to respect the well-established terminology in logic I will keep, in the following, the name "included middle".

[8] See, for example, Ernest Nagel and James R. Newman, *Gödel's Proof*, New York University Press, New York, 1958 ; Hao Wang, *A Logical Journey - From Gödel to Philosophy*, The MIT Press, Cambridge, Massachusetts - London, England, 1996; John L. Casti and Werner DePauli, *Gödel - A Life of Logic*, Perseus Publishing, Cambridge, Massachusetts, 2000.

[9] Cristian S. Calude, *Incompleteness, Complexity, Randomness and Beyond*, preprint arXiv:quant-ph/0111118, 2001.

[10] Basarab Nicolescu, *"Levels of Reality as Source of Quantum Indeterminacy"*, arXiv:quant-ph/0012007, published in "Determinismo e complessità", Armando Editore, Roma, 2000, pp. 127-158, edited by F. Tito Arecchi

[11] Gregory Chaitin, *Exploring Randomness*, Springer, London-Berlin-Heidelberg, 2001.

[12] Walter Thirring, *Do the laws of Nature evolve ?*, in *What is life? - The Next Fifty Years: Speculations on the Future of biology*, Cambridge University Press, USA, 1995, edited by Michael P. Murphy and Luke A. O'Neil.

[13] Basarab Nicolescu, *Science, Meaning and Evolution - The Cosmology of Jacob Boehme*, with selected texts by Jacob Boehme, translated from the French by Rob Baker, foreword by Joscelyn Godwin, afterword by Antoine Faivre, Parabola Books, New York, 1991.

[14] Edgar Morin, *La méthode III - La connaissance de la connaissance/1. Anthropologie de la connaissance*, Seuil, Paris, 1986.

[15] Bernard d'Espagnat, *Le réel voilé - Analyse des concepts quantiques*, Fayard, Paris, 1994.

[16] Mircea Eliade, *L'épreuve du labyrinthe, entretiens avec Claude-Henri Rocquet*, Pierre Belfond, Paris, 1978, p. 175; English translation: *Ordeal by Labyrinth: Conversations with Claude-Henri Roquet*, Chicago University Press, Chicago, 1982, translated from the French by Derek Coltman.

For a brilliant and rigorous discussion, in academic circles, of the controversial status of the sacred see Bryan S. Rennie, *Reconstructing Eliade - Making sense of Religion*, State University of New York Press, Albany, New York, 1996, foreword by Mac Linscott Ricketts.

[17] Werner Heisenberg, *Philosophie - Le manuscrit de 1942*, Seuil, Paris, 1998, translation from the German and introduction by Catherine Chevalley.

[18] Michel Camus, *Proverbes du silence et de l'émerveillement*, Lettres Vives, Paris, 1989, p. 27.

[19] Argyris Nicolaidis, *The Metaphysics of Reason*, talk given at the Symposium "Science and Religion - Antagonism or Complementarity?", Bucharest, Romania, November 8-11, 2001.

[20] Dumitru Staniloaie, *Trairea lui Dumnezeu în ortodoxie*, Dacia, Cluj-Napoca, 1993, p. 86.

[21] Philip Clayton, *The Problem of God in Modern Thought*, William B. Eerdmans Publishing Company, Grand Rapids, Michigan, USA - Cambridge, United Kingdom, 2000.

[22] Thierry Magnin, *Entre science et religion - Quête de sens dans le monde présent*, Rocher, Monaco, coll. "Transdisciplinarité", 1998, foreword by Basarab Nicolescu, afterword by Henri Manteau-Bonamy.

[23] Saint Jean de la Croix, *Oeuvres spirituelles*, Seuil, Paris, 1954, translation by R. P. Grégoire de Saint Joseph, Carme Déchaussé; Saint John of the Cross, *Ascent of the Mount Carmel*, Image Books, New York, 1958, translated and edited by E. Allison Peers.