

Transdisciplinarity – past, present and future

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Going beyond disciplines

Transdisciplinarity is a relatively young approach: it emerged seven centuries after disciplinarity, in the writings of the Swiss philosopher and psychologist Jean Piaget (1896-1980). Piaget (1971) indicates that transdisciplinarity ‘will not be limited to the interactions or reciprocities between the specialised researches, but will locate these links inside a total system without stable boundaries between the disciplines.’ (Piaget, 1972: p. 144) This description has been subject to debate and modifications.

I proposed including the meaning ‘beyond disciplines’ in 1985 (Nicolescu, 1985) and I have developed this idea over the years. Many other researchers over the world have also contributed to this development of transdisciplinarity. A key date in this development is 1994, when the Charter of Transdisciplinarity² was adopted by the participants at the First World Congress of Transdisciplinarity.

This idea came from my long practice of quantum physics. For an outsider, it might seem paradoxical that from the very core of exact sciences we arrive at the idea of the limits of disciplinary knowledge. But there is inside evidence that disciplinary knowledge has reached its own limitations, which has far-reaching consequences not only for science, but also for culture and social life.

The crucial point here is the status of the *Subject*.

Modern science was born through a violent break with the ancient vision of the world. It was founded on the idea – surprising and revolutionary in that era – of a total separation between the *Knowing Subject* and *Reality*. The latter was assumed to be completely independent from the subject who observed it. This break allowed science to develop independently of theology, philosophy and culture. It was a positive act of freedom. But today it is becoming clear that one of the consequences of this break, the ideology of scientism, is the danger of the potential self-destruction of our species.

On the spiritual level, the consequences of scientism have been considerable: the only knowledge worthy of this name must therefore be scientific and objective; the only reality worthy of this name must be objective reality, ruled by objective laws. All knowledge other than scientific knowledge is thus cast into the inferno of subjectivity, tolerated at most as a meaningless embellishment, or rejected with contempt as a fantasy, an illusion, a regression, or a product of the imagination. Even the word ‘spirituality’ has become suspect and its use has been practically abandoned.

Objectivity, set up as the supreme criterion of Truth, has one inevitable consequence: the transformation of the Subject into an Object. The death of the

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² See page 164 for the full text of the Charter.

Subject is the price we pay for objective knowledge. The human being has become an object – an object of the exploitation of man by man, an object of the experiments of ideologies which are proclaimed scientific, an object of scientific studies to be dissected, formalised, and manipulated. The relationship Man–God has become a relationship Man–Object, of which the only result can be self-destruction. The massacres of this century, the multiple local wars, terrorism and environmental degradation are acts of self-destruction on a global scale.

In fact, with very few exceptions – Husserl, Heidegger or Cassirer – modern and post-modern thinkers gradually transformed the Subject in a grammatical subject. The Subject is today just a word in a phrase (Descombes, 2004).

The quantum revolution radically changed this situation. The new scientific and philosophical notions it introduced – the principle of superposition of quantum ‘yes’ and ‘no’ states, discontinuity, non-separability, global causality, quantum indeterminism – necessarily led the founders of quantum mechanics to rethink the problem of the complete Object/Subject separation. For example, Werner Heisenberg, winner of the Nobel Prize for Physics, thought that one must suppress any rigid distinction between the Subject and Object, between objective reality and subjective reality. ‘The concept of ‘objective’ and ‘subjective’ designate [...] two different aspects of one reality; however we would make a very crude simplification if we want to divide the world in one objective reality and one subjective reality. Many rigidities of the philosophy of the last centuries are born by this black and white view of the world.’ (Heisenberg, 1989: p. 269) He also asserts that we have to renounce the privileged reference to the exteriority of the material world. ‘The too strong insistence on the difference between scientific knowledge and artistic knowledge comes from the wrong idea that concepts describe perfectly the ‘real things’ [...] All true philosophy is situated on the threshold between science and poetry.’ (Ibid: pp. 363-364)

My line of thinking is in perfect agreement with that of Heisenberg. For me, ‘beyond disciplines’ precisely signifies the Subject-Object interaction. The transcendence, inherent in transdisciplinarity, is the transcendence of the Subject. The Subject cannot be captured in a disciplinary camp.

The meaning ‘beyond disciplines’ leads us to an immense space of new knowledge. The main outcome has been the formulation of the methodology of transdisciplinarity, which I will analyse in the next section. It allows us also to clearly distinguish between *multidisciplinarity*, *interdisciplinarity* and *transdisciplinarity*.

Multidisciplinarity concerns itself with studying a research topic in not just one discipline only, but in several at the same time. Any topic in question will ultimately be enriched by incorporating the perspectives of several disciplines. The multidisciplinary approach transgresses disciplinary boundaries while its goal remains limited to within the framework of disciplinary research.

Interdisciplinarity has a different goal than multidisciplinary. It concerns the transfer of methods from one discipline to another. Like multidisciplinary, interdisciplinarity transgresses the boundaries of disciplines while its goal still remains within the framework of disciplinary research. Interdisciplinarity even has the capacity to generate new disciplines, like quantum cosmology and chaos theory.

Transdisciplinarity concerns itself with what is *between* the disciplines, *across* the different disciplines, and *beyond* all disciplines. Its goal is the understanding of the

present world, of which one of the imperatives is the unity of knowledge (Nicolescu, 1996).

As one can see, there is no opposition between disciplinarity (including multidisciplinarity and interdisciplinarity) and transdisciplinarity, but a fertile complementarity. In fact, there is no transdisciplinarity without disciplinarity. Nevertheless, the above considerations provoked, around 1990, a more a less violent war of definitions. This war is not yet over.

There is a specific and different approach to transdisciplinarity that is characterised by the refusal to formulate any methodology and by its exclusive concentration on joint problem-solving of problems pertaining to the science-technology-society triad. This approach is represented by people including Michael Gibbons (1994) and Helga Nowotny (1994). The point of view of this transdisciplinary current was largely expressed at the Zürich Congress, in 2000 (Thompson Klein et al., 2001).

This version of transdisciplinarity does not exclude the meaning 'beyond disciplines' but reduces it to the interaction of disciplines with social constraints. The social field necessarily introduces a dimension 'beyond disciplines', but the individual human being is conceived of as part of a social system only.

It is difficult for us to understand why 'joint problem solving' must be the unique aim of transdisciplinarity. It is certainly one of the aims, but not the only aim. The use of the singular seems dangerous to us. As in religion, it would allow for unnecessary wars and unproductive dogmatism. I think that the unconscious barrier to a true dialogue comes from the inability of certain transdisciplinary researchers to think about discontinuity. For them, the boundaries between disciplines are like boundaries between countries, continents and oceans on the surface of the Earth. These boundaries fluctuate in time but one fact remains unchanged: the continuity between territories. We have a different approach to the boundaries between disciplines. For us, they are like the separation between galaxies, solar systems, stars and planets. It is the movement itself that generates the fluctuation of boundaries. This does not mean that a galaxy intersects another galaxy. When we cross the boundaries we meet the interplanetary and intergalactic vacuum. This vacuum is far from being empty: it is full of invisible matter and energy. It introduces a clear discontinuity between territories of galaxies, solar systems, stars and planets. Without the interplanetary and intergalactic vacuum there is no Universe.

It is my deep conviction that our formulation of transdisciplinarity is both unified (in the sense of unification of different transdisciplinary approaches) and diverse: unity in diversity and diversity through unity is inherent to transdisciplinarity.

Much confusion arises by not recognising that there is a *theoretical transdisciplinarity*, a *phenomenological transdisciplinarity* and an *experimental transdisciplinarity*.

The word *theory* implies a general definition of transdisciplinarity and a well-defined methodology.

The word *phenomenology* implies building models connecting the theoretical principles with the already observed experimental data, in order to predict further results.

The word *experimental* implies performing experiments following a well-defined procedure allowing any researcher to obtain the same results when performing the same experiments.

I classify the work done by Michael Gibbons and Helga Nowotny as phenomenological transdisciplinarity, while my own work (Nicolescu, 1985, 1986, 1991, 1996, 1998, 2000, 2002), as well as that of Jean Piaget and Edgar Morin (1999), I would classify as theoretical transdisciplinarity. In turn, experimental transdisciplinarity concerns a large amount of experimental data already collected not only within the framework of knowledge production but also in many fields including education, psychoanalysis, the treatment of pain in terminal diseases, drug addiction, art, literature, history of religions, etc. The huge potential of transdisciplinarity will never be realised if we do not accept the simultaneous and rigorous consideration of the three aspects of transdisciplinarity. This simultaneous consideration of theoretical, phenomenological and experimental transdisciplinarity will allow both a unified and non-dogmatic treatment of transdisciplinary theory and practice, coexisting with a plurality of transdisciplinary models.

Formulation of the methodology of transdisciplinarity

The axiomatic character of the methodology of transdisciplinarity

The most important achievement of transdisciplinarity at present is, of course, the formulation of the methodology of transdisciplinarity, accepted and applied by a considerable number of researchers in many countries of the world.

The axiomatic character of the methodology of transdisciplinarity is an important aspect. It means that the number of axioms (or principles or pillars) has to be limited to a *minimum* number. Any axiom that can be derived from the already postulated ones, has to be rejected.

This fact is not new. It arose when disciplinary knowledge acquired its scientific character, due the three axioms formulated by Galileo Galilei (1956, 1992) in *Dialogue on the Great World Systems*:

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

It should be obvious that if we try to build a mathematical bridge between science and ontology, we will necessarily fail. Galileo himself makes the distinction between human mathematics and divine mathematics (Galileo, 1992: p. 192). Human mathematics constitutes 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. Transdisciplinarity tries to seriously take this distinction into account. A bridge can be built between science and ontology only by taking into account the totality of human knowledge. This requires a symbolic language, different from mathematical language and enriched by specific new notions. Mathematics is able to describe repetition of facts due to scientific laws, but transdisciplinarity is also about the singularity of the human being and human life. The key-point here is, once

again, the irreducible presence of the Subject, which explains why transdisciplinarity cannot be described by a mathematical formalism. The dream of the mathematical formalisation of transdisciplinarity is just a phantasm, the phantasm induced by centuries of disciplinary knowledge.

We have arrived (Nicolescu, 1996) at the following three axioms of the methodology of transdisciplinarity:

The ontological axiom: *In Nature and in our knowledge of Nature, there are different levels of Reality and, correspondingly, different levels of perception.*

The logical axiom: *The passage from one level of Reality to another is insured by the logic of the included middle.*

The complexity axiom: *The structure of 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 axioms derive their experimental evidence from quantum physics, but they go well beyond the exact sciences. The third axiom has its source not only in quantum physics but also in a variety of other exact and human sciences. All three are in agreement with traditional thinking, present from the beginning of historical times.

Axioms cannot be demonstrated: they are not theorems. They have their roots in experimental data and theoretical approaches and their validity is judged by the results of their applications. If the consequences of the given axioms contradict experimental facts, the axioms have to be modified or replaced.

In spite of an almost infinite diversity of methods, theories and models, which run throughout the history of different scientific disciplines, the three methodological postulates of modern science have remained unchanged from Galileo until the present day. Let us hope that the same will prove to be true for transdisciplinarity and that a large number of transdisciplinary methods, theories and models will appear in the future.

Only one science has entirely and integrally satisfied the three Galilean postulates: physics. The other scientific disciplines only partially satisfy the three methodological postulates of modern science. However, the absence of rigorous mathematical formulation in psychology, psychoanalysis, history of religions, legal theory and a multitude of other disciplines has not led to the elimination of these disciplines from the field of science. Not even an exact science like molecular biology can claim a mathematical formulation as rigorous as that of physics. In other words, there are *degrees of disciplinarity* which can respectively take into account more or less completely the three methodological postulates of modern science. Likewise, the process of more or less taking completely into account the three methodological pillars of transdisciplinary research will generate different *degrees of transdisciplinarity*. Large avenues are open for rich and diverse transdisciplinary research.

The above three axioms (ontological, logical and complexity) give a precise and rigorous *definition of transdisciplinarity*.

Let me now describe the essentials of these three transdisciplinary axioms.

The ontological axiom: levels of Reality and levels of perception

The key concept of the transdisciplinary approach to Nature and knowledge is the concept of *levels of Reality*.

Here the meaning we give to the word Reality is pragmatic and ontological at the same time. By Reality we mean primarily that which *resists* our experiences, representations, descriptions, images, or even mathematical formulations.

In so far as Nature participates in the being of the world, one has to also assign an ontological dimension to the concept of Reality. Reality is not merely a social construction, the consensus of a collectivity, or some inter-subjective agreement. It also has a trans-subjective dimension: for example, experimental data can ruin the most beautiful scientific theory.

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. The Real is, by definition, veiled for ever, while Reality is accessible to our knowledge.

By ‘level of Reality’, I designate a set of systems which are invariant under certain laws: for example, quantum entities are subordinate to quantum laws, which depart radically from the laws of the macro-physical world. That is to say, two levels of Reality are different if, while passing from one to the other, there is a break in the applicable laws and a break in fundamental concepts (e.g. causality). Therefore there is a *discontinuity* in the structure of levels of Reality, similar to the discontinuity reigning over the quantum world.

Every level of Reality has its associated space-time, different from one level to the other. For example, the classical notion of reality is associated with 4-dimensional space-time (three dimensions of space and one dimension of time), while the quantum notion of reality is associated with a space-time whose number of dimensions is greater than four. The introduction of the levels of Reality induces a multidimensional and multireferential structure of Reality.

A new *Principle of Relativity* (Nicolescu, 1996, pp. 54-55) emerges from the coexistence of complex plurality and open unity in our approach: *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 is what creates a new perspective on religion, politics, art, education, and social life. And when our perspective on the world changes, the world changes.

In other words, our approach is not hierarchical. There is no fundamental level. But its absence does not mean an anarchical dynamic, but a coherent one, of all levels of Reality, already discovered or which will be discovered in the future.

Every level is characterised by its *incompleteness*: the laws governing this level are just a part of the totality of laws governing all levels. And even the totality of laws does not exhaust the entire Reality: we also have to consider the Subject and its interaction with the Object.

The zone between two different levels and beyond all levels is a zone of non-resistance to our experiences, representations, descriptions, images and mathematical formulations. Quite simply, the transparency of this zone is due to the limitations of our bodies and of our sense organs – limitations which apply regardless of the measuring tools that are used to extend these sense organs. We therefore have to conclude that the topological distance between levels is finite. However this finite

distance does not mean a finite knowledge. Take, as an image, a segment of a straight line – it contains an infinite number of points. In a similar manner, a finite topological distance could contain an infinite number of levels of Reality. We have work to do till the end of time.

The zone of non-resistance corresponds to the sacred – that which does not submit to any rationalisation. Proclaiming that there is a single level of Reality eliminates the sacred, and self-destruction is generated.

The unity of levels of Reality and its complementary zone of non-resistance constitutes what we call the transdisciplinary Object.

Inspired by the phenomenology of Edmund Husserl (1966), I assert that the different levels of Reality are accessible to our knowledge as a result of the different levels of perception which are potentially present in our being. These levels of perception 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 presupposes a zone of non-resistance to perception.

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

In a rigorous way, we see that ‘levels of perception’ are, in fact, *levels of Reality of the Subject*, while ‘levels of Reality’ are, in fact, *levels of Reality of the Object*. Both types of levels imply resistance.

Knowledge is neither exterior nor interior: it is simultaneously exterior and interior. The studies of the universe and of the human being sustain one another.

The zone of non-resistance plays the role of a *third party* between the Subject and the Object, an Interaction term, which acts like a secretly included middle that allows the unification of the transdisciplinary Subject and the transdisciplinary Object while preserving their difference. In the following I will call this Interaction term the Hidden Third.

Our ternary partition {Subject, Object, Hidden Third} is, of course, different from the binary partition {Subject vs. Object} of classical realism.

The emergence of at least three different levels of Reality in the study of natural systems – the macro-physical level, the microphysical level and cyber-space-time (to which one might add a fourth level – that of superstrings, unifying all physical interactions) – is a major event in the history of knowledge.

Based upon our definition of levels of Reality, we can identify other levels than the ones in natural systems. For example, in social systems, we can speak of the individual level, the geographical and historical community level (family, nation), the cyber-space-time community level and the planetary level.

Levels of Reality are radically different from levels of organisation as these have been defined in systemic approaches (Camus et al., 1998). Levels of organisation do not presuppose a discontinuity in the fundamental concepts: several levels of organisation can appear at one and the same level of Reality. The levels of organisation correspond to different structures of the same fundamental laws.

The levels of Reality and the levels of organisation offer the possibility of a new taxonomy of the more than 8000 academic disciplines existing today. Many disciplines coexist at one and the same level of Reality even if they correspond to different levels

of organisation. For example, Marxist economy and classical physics belong to one level of Reality, while quantum physics and psychoanalysis belong to another level of Reality.

The existence of different levels of Reality has been affirmed by different traditions and civilizations, but this affirmation was founded either on religious dogma or on the exploration of the interior universe only.

The transdisciplinary Object and its levels of Reality, the transdisciplinary Subject and its levels of perception and the Hidden Third define the transdisciplinary model of Reality. Based on this ternary structure of Reality, we can deduce other ternaries of levels, which are extremely useful in the analysis of concrete situations:

Levels of organisation – Levels of structuring – Levels of integration
Levels of confusion – Levels of language – Levels of interpretation
Physical levels – Biological levels – Psychical levels
Levels of ignorance – Levels of intelligence – Levels of contemplation
Levels of objectivity – Levels of subjectivity – Levels of complexity
Levels of knowledge – Levels of understanding – Levels of being
Levels of materiality – Levels of spirituality – Levels of non-duality

In 1998, I was greatly surprised to discover the idea of ‘levels of Reality’, expressed in a book by Werner Heisenberg, *Philosophy - The manuscript of 1942* (1998). This book has a quite astonishing history: it was written in 1942 but it was published in German only in 1984. I read the French translation of the book in 1998. There is not yet, to my knowledge, an English translation of this book.

The philosophy of Heisenberg is based on two main ideas: the first is the notion of levels of Reality corresponding to different modes of embodying objectivity in terms of the respective process of knowledge and the second is the gradual erasing of the familiar concept of 3-dimensional space and 1-dimensional time.

For Heisenberg, reality is ‘the continuous fluctuation of the experience as captured by consciousness. In that sense, it can never be identified to a closed system [...]’ (Heisenberg, 1998: p. 166). By ‘experience’, he understands not only scientific experiments but also the perception of the movement of the soul or of the autonomous truth of symbols. For him, reality is a tissue of connections and of infinite abundance, without any ultimate foundation.

‘One can never reach an exact and complete portrait of reality’, (Ibid., p. 258) writes Heisenberg.

The incompleteness of physical laws is therefore present in his philosophy.

Heisenberg asserts many times, in agreement with Husserl, Heidegger and Cassirer (whom he knew personally), that one has to suppress any rigid distinction between the Subject and Object. He also writes that one has to renounce the privileged reference to the exteriority of the material world and that the only way to understand the nature of reality is to accept its division in regions and levels.

Heisenberg classifies the numerous regions of reality in only three levels, in terms of the different proximity between the Object and the Subject (Ibid., p. 372). He deduces that the rigid distinction between exact and human sciences has to be abandoned, a fact which sounds very, very transdisciplinary.

Heisenberg's first level of reality corresponds to fields which embody objectivity independently of the knowledge process. Classical physics, electromagnetism and Einstein's two theories of relativity belong to this level.

The second level corresponds to fields that are inseparable from the knowledge process: quantum mechanics, biology and the sciences of consciousness (e.g. psychoanalysis).

Finally, the third level corresponds to fields created in connection with the knowledge process. He situates there philosophy, art, politics, the metaphors concerning God, the religious experience and the artistic creative experience.

If the first two levels of Heisenberg totally correspond to my own definition, the third one mixes levels and non-levels (in other words, the zones of non-resistance). The religious experience and the artistic creative experience cannot be assimilated to levels of Reality. They merely correspond to crossing levels in the zone of non-resistance. The absence of resistance and especially the absence of discontinuity in the philosophy of Heisenberg explain the difference between his approach and mine. A rigorous classification of regions in levels cannot be obtained in the absence of discontinuity.

Heisenberg insists on the crucial role of intuition: 'Only an intuitive thinking could bridge the abyss between old and new concepts; the formal deduction is impotent in realising this bridge [...].' (Idem, p. 261) But Heisenberg did not draw the logical conclusion concerning this impotence of formal thinking: only the non-resistance to our experiences, representations, descriptions, images or mathematical formalisms can bridge the abyss between two levels. This non-resistance restores the continuity broken by levels.

The logical axiom: the included middle

The incompleteness of the general laws governing a given level of Reality signifies that, at a given moment of time, one necessarily discovers contradictions in the theory describing the respective level: one has to assert A and non-A at the same time. This Gödelian feature of the transdisciplinary model of Reality is verified by the whole of the history of science: a theory leads to contradictions and one has to invent a new theory that solves these contradictions. This is precisely how we went from classical physics to quantum physics.

However, our habits of mind, scientific or not, are still governed by the classical logic, which does not tolerate contradictions. The classical logic is founded on three axioms:

- *The axiom of identity:* A is A.
- *The axiom of non-contradiction:* A is not non-A.
- *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.

Knowledge of the coexistence of the quantum world and the macro-physical world and the development of quantum physics have led, at the level of theory and scientific experiment, to pairs of mutually exclusive contradictories (A and non-A): wave and corpuscle, continuity and discontinuity, separability and non-separability, local causality and global causality, symmetry and breaking of symmetry, reversibility and irreversibility of time, and so forth.

The intellectual scandal provoked by quantum mechanics consists precisely of the fact that the pairs of contradictories that it generates are actually mutually exclusive when they are analyzed through the interpretive filter of classical logic.

However, the solution is relatively simple: one has to abandon the third axiom of classical logic, imposing the exclusion of the third, the included middle T. History will credit Stéphane Lupasco (1900-1988) (Badescu and Nicolescu (ed.), 1999) with having shown that the logic of the included middle is a true logic, mathematically formalised, multivalent (with three values: A, non-A, and T) and non-contradictory (Lupasco, 1951).

In fact, the logic of the *included* middle is the very heart of quantum mechanics: it allows us to understand the basic principle of the superposition of ‘yes’ and ‘no’ quantum states.

Heisenberg was fully conscious of the necessity of adopting the logic of the included middle. ‘There is a fundamental principle of classical logic which seems to need to be modified: in classical logic, if one assertion has a meaning, one supposes that either this assertion or its negation has to be true. Only one of the sentences ‘There is a table here’ and ‘There is no table here’ is true. There is not a third possibility and this is the principle of the excluded middle. [...] In quantum theory, one has to modify this law of the excluded middle.’

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, let us represent 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*.

If one remains at a single level of Reality, all manifestation appears as a struggle between two contradictory elements. The third dynamic, that of the T-state, is exercised at another level of Reality, where that which appears to be disunited is in fact united, and that which appears contradictory is perceived as non-contradictory.

It is the projection of the T-state onto the same single level of Reality which produces the appearance of mutually exclusive, antagonistic pairs (A and non-A). A single level of Reality can only create antagonistic oppositions. It is inherently self-destructive if it is completely separated from all the other levels of Reality. A third term, which is situated at the same level of Reality as that of the opposites A and non-A, cannot achieve their reconciliation. Of course, this conciliation is only temporary. We necessarily discover contradictions in the theory of the new level when this theory confronts new experimental facts. 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 logic of the included middle does not abolish the logic of the excluded middle: it only constrains its sphere of validity. The logic of the excluded middle is certainly valid for relatively simple situations, for example, driving a car on a highway:

no one would dream of introducing an included middle in regard to what is permitted and what is prohibited in such circumstances.

On the contrary, the logic of the excluded middle is harmful in complex cases, for example, within the economic, social, cultural, religious or political spheres. In such cases it operates like a genuine logic of exclusion: good or evil, right or left, heaven or hell, alive or dead, women or men, rich or poor, whites or blacks. It would be revealing to undertake an analysis of xenophobia, racism, apartheid, anti-Semitism, or nationalism in the light of the logic of the excluded middle. It would also be very instructive to examine the speeches of politicians through the filter of that logic.

There is certainly 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.

The included middle logic is a *tool for an integrative process*: it allows us to cross two different levels of Reality or of perception and to effectively integrate, not only in thinking but also in our own being, the coherence of the Universe.

The use of the included third is a *transformative process*. But, at that moment, the included third ceases to be an abstract, logical tool: it becomes a living reality touching all the dimensions of our being. This fact is particularly important in education and learning.

It is important to note that the combined action of the ontological and logical axioms engender the notion of *paradox*. The paradox is the suspension of the contradictories (A, non-A) in the space between two levels of Reality. Therefore, there is no need to introduce paradox as a 4th axiom of transdisciplinarity (Paul, 2003).

Recent findings in the physiology of the brain give a particularly deep understanding of the action of the included middle. High technology tools, like single photon emission computed tomography, allow us to rigorously visualise the blood flow patterns in the brain during widely differing activities such as solving a mathematical problem or Zen meditation. Different specialised zones of the brain are now identified. Of course, the notion itself of ‘reality’ is empty without the participation of the brain. This does not necessarily mean that the brain creates reality. We can merely say that we have inside ourselves an apt apparatus for perceiving reality.

Based on these neurophysiological discoveries, Andrew Newberg and Eugene d’Aquili introduced a series of *cognitive operators*, which describe the general functions of the human mind (Newberg et al., 2001). Between them, of particular interest for us are the binary operator and the holistic operator.

The binary operator means the ‘human brain’s ability to reduce the most complicated relationships of space and time to simple pairs of opposites – above and below, in and out, left and right, before and after, and so on’ and it ‘gives the mind a powerful method of analyzing external reality’ (Newberg et al., 2001: p. 63). The brain constructs in such a way, during the evolutionary process, a binary representation of the world, very useful for survival in a hostile environment. However, culture has extended this binary representation, in terms of exclusive contradictories, to ethical, mythological and metaphysical representations, like good and evil, the space-time

background of such representations being erased. The binary operator describes, in fact, the neurological operations of the inferior parietal lobe (Ibid., p. 51). The classical logic is a product of the inferior parietal lobe.

In its turn, the *holistic operator* ‘allows us to see the world as a whole. [...] The holistic operator most likely rises from the activity of the parietal lobe in the brain’s right hemisphere.’ (Ibid., p. 48) The holistic view is also a product of the evolutionary process. When our ancestors were confronted with a wild animal, the binary representations were not sufficient for survival. If our ancestors had spent their time analyzing the different parts of the wild animal and the associated pairs of the mutually exclusive contradictories, they would simply have been killed and we would not be here to think about an excluded or included middle. The holistic operator erases contradictories and therefore is connected with the action of the included middle.

The complexity axiom: the universal interdependence

There are several theories of complexity. Some of them, like the one practised at the Santa Fe Institute, under the general guidance of Murray Gell-Mann, winner of the Nobel Prize for Physics, are mathematically formalised, while others, like that of Edgar Morin, widely known in Latin America, are not.

In the context of our discussion, what is important to understand is that the existing theories of complexity include neither the notion of levels of Reality nor the notion of zones of non-resistance (Nicolescu, 1996, 1998, 2000). However, some of them, like the one of Edgar Morin (1977, 1980, 1986, 1991, 2001), are compatible with these notions. It is therefore useful to distinguish between *horizontal complexity*, which refers to a single level of reality and *vertical complexity*, which refers to several levels of Reality. It is also important to note that *transversal complexity* is different from vertical, transdisciplinary complexity. Transversal complexity refers to crossing different levels of organisation at a single level of Reality.

In a paradoxical way, in fundamental physics, complexity is embedded in the very heart of simplicity. Indeed, popular works state that contemporary physics is a physics where a wonderful simplicity rules (in fact, more rigorously said, *simplicity* rules), through fundamental ‘building-blocks’ – quarks, leptons and messengers of physical interactions. But for physicists working within physics, the situation appears infinitely more complex.

For example, according to the superstring theory in particle physics, physical interactions appear to be very simple, unified, and subordinate to general principles if they are traced within a multidimensional, 11-dimensional space–time (10 dimensions of space and 1 dimension of time) and involve an incredible amount of energy, corresponding to Planck’s mass. But complexity appears at the moment of describing our familiar world, which is characterised by four dimensions and by low energies. Unified theories are at their strongest at the level of general principles, but they are very poor at describing the complexity at our own level of reality.

From a transdisciplinary point of view, complexity is a modern form of the very ancient principle of universal interdependence. This recognition allows us to avoid the current confusion between complexity and complication. The principle of universal interdependence entails the maximum possible simplicity that the human mind could imagine, the simplicity of the interaction of all levels of reality. This simplicity cannot

be captured by mathematical language, but only by symbolic language. Mathematical language addresses exclusively the analytical mind, while symbolic language addresses the totality of the human being, with its thoughts, feelings and body.

It is interesting to note that the combined action of the ontological, logical and complexity axioms engenders values. Therefore, there is no need to introduce values as a 4th axiom (Cicovacki, 2003). The transdisciplinary values are neither objective nor subjective. They result from the Hidden Third, which signifies the interaction of the subjective objectivity of the transdisciplinary Object and the objective subjectivity of the transdisciplinary Subject.

Future paths

After a long hibernation of a quarter of century since Piaget, transdisciplinarity experiencing an accelerated development in the 1990s. Today, transdisciplinary activities are flourishing in many parts of the world (Nicolescu (ed.), 2005). Transdisciplinary institutes, associations and networks are being created in Brazil, France, Italy, Canada, Romania, South Africa and Switzerland. Important international conferences have dedicated entire sessions on transdisciplinarity, in Russia, Turkey, Canada, Austria, the USA, the Netherlands and other countries. New transdisciplinary magazines are constantly being published in several countries and on the internet. A surprisingly large number of transdisciplinary books have been published in the last few years, covering an amazingly diverse range of subjects, such as education, 'science and religion' studies, economics, management, therapy, geography and landscape studies, post-colonialism, nursing, health, social science, storybook activities for children and even studies of the work of Jacques Derrida from a transdisciplinary point of view. Two publishers in France, one in Brazil and one in Romania have founded 'Transdisciplinarity' series. A quite new phenomenon, transdisciplinary lectures are now given in several universities in the USA, Spain, Romania, France, Brazil and even transdisciplinary chairs have been created.

We are now living in a new period of the advancement of transdisciplinarity.

The theory of transdisciplinarity is fully developed. Now the time for action has arrived. In the past, our actions were concentrated in the field of education, a fact which is natural because of the central role of education in individual and social life. But now we are obliged ethically to extend our activities in the scientific, social, political and spiritual realms.

Let me describe, in few words, the kind of actions that are, in my opinion, of an urgent nature.

Development of transdisciplinary higher education

Transdisciplinary education, based on the transdisciplinary methodology, allows us to establish links between persons, facts, images, representations, fields of knowledge and action and to discover the Eros of learning during our entire life. The creativity of the human being is conditioned by permanent questioning and permanent integration.

The epistemological aspects of transdisciplinarity presented above were studied on a practical level in 1997 at the International Congress held in Locarno, 'What University for tomorrow? Towards the transdisciplinary evolution of education',

sponsored by UNESCO, CIRET and the Government of Ticino (Locarno Declaration, 1997). The participants adopted the Declaration of Locarno, and experiments conforming to the recommendations of the Locarno Congress have already been performed in different countries: Brazil, Canada, France, Romania, USA, Switzerland, Argentina and Spain. The Locarno Congress also stimulated a rich theoretical reflection, in particular on the invention of new methods of education in relation to the new technologies (Harvey and Lemire, 2001). An entire recent issue of the E-zine ‘Transdisciplinary Encounters’ was dedicated to experiences in transdisciplinary education (Bot (ed.), 2005). Similar experiments have also been carried out, independently of the Locarno Congress, in different countries.

One of the important points is that we have accumulated a lot of useful data from practical work, justifying one of the basic assumptions of the transdisciplinary education. In transdisciplinarity, we always talk about three types of intelligences: the analytical intelligence, the feeling’s intelligence and the intelligence of the body. This idea is similar to the idea of multiple intelligences developed by Howard Gardner (1999). The difference with the theory of Gardner is that we speak, in fact, about a new type of intelligence, founded upon the equilibrium between mind, body and feelings. Transdisciplinary education is an *integral education*. A person is therefore not confined to choose a job connected with his or her own type of intelligence, but he or she is able to exercise his or her freedom of choice, as a result of the internal flexibility between the three types of intelligence which, in fact, everybody possesses.

At the beginning, our claims sounded exotic, like a new utopia. It is very encouraging that recent scientific work in biology, such as that of Antonio Damasio (1999), demonstrates the cognitive dimension of feelings and emotions. Also, in a very stimulating book, Jean-Louis Revardel shows the extraordinary pertinence of the axioms of transdisciplinarity in studying the universe of affectivity (Revardel, 2003).

Another significant point is that important work on the formation of transdisciplinary educators has already been performed, for example in Brazil (through the persistent and rigorous actions of CETRANS (CETRANS; de Mello, 2000, 2003) and several other Brazilian organisations and universities), in Romania (Bertea, 2003) and in France, at the University of Tours (Demol (ed.), 2003; Paul and Pineau (ed.), 2005) and in other French universities.

In fact, networks of transdisciplinary educators are now present in different countries. They enable us to think in terms of three new stages in transdisciplinary education.

First of all, it is important to introduce courses on transdisciplinarity in as many universities as possible. Of course, transdisciplinary courses are not very rare, but we know of only one example of a course *on* transdisciplinarity, i.e. about the epistemological foundations and practical applications of transdisciplinarity. The Claremont Graduate University (CGU), one of the most highly rated universities in United States, recently instituted a new transdisciplinary course requirement for all doctoral students. The mission of CGU is to prepare a diverse group of outstanding individuals to assume leadership roles in the worldwide community through teaching, research and practice in selected fields. At Claremont, all PhD students must now take a ‘T course’ (‘T’ for ‘transdisciplinary’) sometime in the first two years of their programme. A second important development would be the creation of a PhD in

transdisciplinary studies. There are several examples of transdisciplinary PhD theses,³ but they were all performed within a given discipline. There is even a PhD thesis in philosophy, on the foundations of transdisciplinarity (Bambara, 2002). However, the time has now arrived to create a specific PhD in transdisciplinary studies. It will create the appropriate space for academic studies and also for social action in the field of transdisciplinarity. It will also allow students with transdisciplinary interests to find an appropriate place to accomplish their research. The very prestigious Stellenbosch University in South Africa is at an advanced stage of creating such a PhD.

A third important development would be the creation of a Virtual Global Transdisciplinary University. This is feasible, given the existence of transdisciplinary networks in several countries and the extraordinary advancement of informatics today.

Towards a human model of health

In many contemporary societies, the human being is increasingly becoming a collection of numbers, codes and electronic files. The physical body itself is seen as a juxtaposition of genes, cells, neurons and internal organs, each organ and part thereof being under the control of super-specialists who do not communicate between themselves. Of course, high technology treats these organs, prolonging our life, and nobody can complain about this positive fact. However, no high technology can treat the entirety of the human being.

In this context, transdisciplinarity can contribute to the emergence of a new health system. One might think that this is again a utopia, an unnecessary luxury. However, empirical data accumulated show that transdisciplinary teams, acting in the field of health, can bring about a better quality health care system – a system which succeeds in simultaneously satisfying our bodily, mental and psychical needs whilst, at the same time, reducing the costs of having to treat all the different maladies and disorders separately.

Very interesting transdisciplinary experiments have been performed in Québec, in Canada, where the Institute for Health Research of Canada (IRSC) is assisting such initiatives. These include mention the activities of the transdisciplinary team of Patrick Loisel (2005), Professor of Medicine at the University of Sherbrooke, acting in the field of workplace handicaps, which affect more than one million of Canadians per year. Another example is the transdisciplinary team of Daniel Boisvert (2005), Professor at the University of Québec at Trois Rivières, acting in the field of intellectual deficiencies, which affect more than one million persons in Québec and France. Interestingly enough, these experiences demonstrate very directly, at a very concrete level, the three pillars of transdisciplinarity.

Scientific studies on consciousness

Only a few years ago, ‘consciousness’ was still a forbidden word in scientific research, being regarded as a kind of magic reminiscence. However, scientists have slowly started to recognise that there is a missing link between neurons and the human being. John Eccles, winner of the Nobel Prize for Physiology and Medicine, is amongst the pioneers in this regard (Eccles, 1989).

³ See Transdisciplinary PhD theses in the References.

Like quantum mechanics, the scientific theory of consciousness will certainly be a collective creation. It is important to create transdisciplinary teams involving neurophysiologists, physicists and other disciplinary specialists of exact and human sciences, animated by a transdisciplinary attitude. Brain and mind, like anything in this world, involve different levels of Reality and perception. I am personally convinced that consciousness is the ultimate frontier of science and philosophy in the 21st century and that transdisciplinarity has very much to contribute to this advancement of science.

Dialogue between cultures and between religions

The transdisciplinary model of Reality allows us to define three types of meaning:

Horizontal meaning: interconnections at one single level of Reality. This is what most of the academic disciplines do.

Vertical meaning: interconnections involving several levels of Reality. This is what poetry, art or quantum physics do.

Meaning of meaning: interconnections involving all of Reality – the Subject, the Object and the Hidden Third. This is the ultimate aim of transdisciplinary research.

It may seem paradoxical to speak about cultures and religions in transdisciplinarity, which seems to refer, by the word itself, to academic disciplines. However, the presence of the Hidden Third explains this fake paradox.

The crucial difference between academic disciplines on the one hand and cultures and religions on the other can be easily understood in our approach. Cultures and religions are not concerned, as academic disciplines are, with fragments of levels of Reality only: they simultaneously involve one or several levels of Reality, one or several levels of perception *and* the non-resistance zone of the Hidden Third.

Technoscience is entirely situated in the zone of the Object, while cultures and religions span all three terms: the Object, the Subject and the Hidden Third. This asymmetry demonstrates the difficulty of their dialogue: this dialogue can occur only when there is a *conversion* of technoscience towards values, i.e. when the technoscientific culture becomes a true culture (Nicolescu, 2004). It is precisely this conversion that transdisciplinarity is able to perform. This dialogue is methodologically possible, because the Hidden Third crosses all levels of Reality.

Technoscience is in quite a paradoxical situation. In itself, is blind to values. However, when it enters into a dialogue with cultures and religions, it becomes the best mediator for the reconciliation of different cultures and different religions.

Creating networks of networks

The existence of transdisciplinary networks is today a fact of life. Of course, this process will continue in the future.

The very existence of these networks signifies that the number of transdisciplinary experts is continuously increasing. These researchers are certainly not ‘experts’ in the usual meaning of this word: they are not ultra-specialists in a very narrow discipline. However they are transdisciplinary experts, because they have knowledge of the methodology of transdisciplinarity, because they are involved in practical applications of transdisciplinarity and because they are socially attached to

transdisciplinary values. These transdisciplinary experts constitute the seeds of transdisciplinary local networks. These networks have to link up in order to form networks of networks, crucially important for action at a national or regional level. In the not too distant future, these different networks of networks will join in order to form a planetary network of networks, which will be the seed of the transdisciplinary culture.

The transdisciplinary culture is a necessity of our time, due to two contradictory facts: on one side, the inner evolution of knowledge and, on the other side, the process of globalisation.

The inner evolution of knowledge is marked by the already mentioned disciplinary big-bang. It is therefore more and more difficult to understand the complexity of our world today and to take appropriate decisions: an expert in one discipline is ignorant of thousands and thousands of other disciplines. The decision-makers are confronted with this fact.

From another angle, globalisation requires, by its own dynamics, that bridges be built as well as links between different areas of knowledge and between different views of the world. If globalisation is to be reduced to only the economic dimension, it will inevitably lead to new exclusions and a new form of slavery. Globalisation with a human face, serving the human race, requires a transdisciplinary culture, able to harmonise different fields of knowledge, different cultures and different views of the world.

Creating examples of living sustainability

In April 2005, I had the privilege of visiting the Lynedoch EcoVillage Development just outside Stellenbosch in South Africa where I witnessed an emerging example in sustainable living. Lynedoch EcoVillage Development is a very good working example of an *integrated sustainable development* approach where strategies and action plans are being consciously pursued and implemented to *connect* social, economic and ecological objectives whilst incorporating technologies that span the fields of energy, water, waste and sanitation and building materials. Lynedoch is also a learning and educational hub. As a socially mixed community – kept apart by years of racist policies and practices – it is organised around not only a child-centred learning precinct, but it is also home to the *Sustainability Institute*, which offers an MPhil degree in Sustainable Development, where students from across the African continent can learn about sustainability in action.

From a transdisciplinary point of view, if our aim is to not only understand the world, but to also find solutions to the complex problems facing us all today, including having to change the systems of reference which produce these problems, then we simply have no choice but to act decisively in our search for alternative, sustainable modes of living. In the ‘Planetary Era’ there is no one single, big problem – only series of overlapping, interconnected problems – that Edgar Morin so aptly described as a ‘polycrisis’ (Morin and Kern, 1993: p. 109). How we as the human species are going to respond to this over the next decade or two might very well be decisive for our peaceful and continued existence on the Earth. From a transdisciplinary point of view, it is our duty and responsibility to use all the means at our disposal – spiritual, theoretical and practical – to find sustainable solutions to problems which, if they remain unresolved, will affect each one of us on this beautiful

planet ours – rich and poor, young and old, Muslim and Christian, believer and non-believer, male and female, North and South, West and East.

Building a new spirituality

‘Spirituality’ is a completely devalued word today, in spite of its etymological meaning as ‘respiration’, in an act of communion between us and the cosmos. There is great spiritual poverty present on our Earth, manifest as fear, violence, hate and dogmatism. In a world with more than 10,000 religions and religious movements and more than 6,000 tongues, how can we dream about mutual understanding and peace? (Welter (Ed.), 2005) There is an obvious need for a new spirituality, conciliating technoscience and wisdom. Of course, there are already several spiritualities that have been present on our Earth for centuries and even millennia. One might ask: why is there a need for a new spirituality if we have them all, here and now?

Before answering to this question, we must face a preliminary question: is a Big Picture still possible in our post-modern times? Radical relativism answers this question in a negative way. However, its arguments are not solid or logical. They are in fact very poor and obviously linked to the totalitarian aspect of the political and philosophical correctness expressed by the slogan ‘anything goes’. For radical relativists, after the death of God, the death of Man, the end of ideologies, the end of History (and, perhaps, tomorrow, the end of science and the end of religion) a Big Picture is no longer possible. For transdisciplinarity, a Big Picture is not only possible but also vitally necessary, even if it will never be formulated as a closed theory. We are happy that the well-known art critic Suzi Gablik, in her book *Has Modernism Failed?* (Gablik, 2004)⁴, recently joined our point of view. The last chapter of her book is entitled ‘Transdisciplinarity – Integralism and the New Ethics’. For her, the essential intellectual change of the last two decades is precisely transdisciplinarity. This change was anticipated by the great quantum physicist Wolfgang Pauli (1900-1958), winner of the Nobel Prize for Physics, who wrote fifty years ago: ‘Facing the rigorous division, from the 17th century, of human spirit in isolated disciplines, I consider the aim of transgressing their opposition [...] as the explicit or implicit myth of our present times.’ (Pauli, 1999)⁵

The first motivation for a new spirituality is technoscience, with its associated fabulous economic power, which is simply incompatible with present spiritualities. It drives a hugely irrational force of efficiency for efficiency’s sake: everything which can be done will be done, for the worst or the best. The second motivation for a new spirituality is the difficulty of the dialogue between different spiritualities, which often appear to be antagonistic, as we can testify in our everyday life. The new phenomenon of planetary terrorism is not foreign to these two problems.

In simple words, we need to find a spiritual dimension of democracy. Transdisciplinarity can help with this important advancement of democracy, through its basic notions of ‘transcultural’ and ‘transreligious’ (Nicolescu, 1996).

The *transcultural* designates the opening of all cultures to that which cuts across them and transcends them, while the *transreligious* designates the opening of all

⁴ The first edition was published in 1984.

⁵ Chapter ‘Science and Western Thinking’, p. 178. This chapter was first published in 1955, in *Europa – Erbe und Aufgabe*, Internationaler Gelehrtekongress, Meinz.

religions to that which cuts across them and transcends them (Nicolescu, 2003). This does not mean the emergence of a unique planetary culture and of a unique planetary religion, but of a new *transcultural and transreligious attitude*. The old principle ‘unity in diversity and diversity in unity’ is embodied in transdisciplinarity.

Through the transcultural, which leads to the transreligious, the spiritual poverty could be eradicated and therefore render the war of civilizations obsolete. The transcultural and transreligious attitude is not simply a utopian project – it is engraved in the very depths of our being.

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CHARTER OF TRANSDISCIPLINARITY

(adopted at the First World Congress of Transdisciplinarity, Convento da Arrábida, Portugal, November 2-6, 1994)

Preamble

Whereas, the present proliferation of academic and non-academic disciplines is leading to an exponential increase of knowledge which makes a global view of the human being impossible;

Whereas, only a form of intelligence capable of grasping the cosmic dimension of the present conflicts is able to confront the complexity of our world and the present challenge of the spiritual and material self-destruction of the human species;

Whereas, life on earth is seriously threatened by the triumph of a techno-science that obeys only the terrible logic of productivity for productivity's sake;

Whereas, the present rupture between increasingly quantitative knowledge and increasingly impoverished inner identity is leading to the rise of a new brand of obscurantism with incalculable social and personal consequences;

Whereas, an historically unprecedented growth of knowledge is increasing the inequality between those who have and those who do not, thus engendering increasing inequality within and between the different nations of our planet;

Whereas, at the same time, hope is the counterpart of all the afore-mentioned challenges, a hope that this extraordinary development of knowledge could eventually lead to an evolution not unlike the development of primates into human beings;

Therefore, in consideration of all the above, the participants of the First World Congress of Transdisciplinarity (Convento da Arrábida, Portugal, November 2-7, 1994) have adopted the present Charter, which comprises the fundamental principles of the community of transdisciplinary researchers, and constitutes a personal moral commitment, without any legal or institutional constraint, on the part of everyone who signs this *Charter*.

Article 1:

Any attempt to reduce the human being by formally defining what a human being is and subjecting the human being to reductive analyses within a framework of formal structures, no matter what they are, is incompatible with the transdisciplinary vision.

Article 2:

The recognition of the existence of different levels of reality governed by different types of logic is inherent in the transdisciplinary attitude. Any attempt to reduce reality to a single level governed by a single form of logic does not lie within the scope of transdisciplinarity.

Article 3:

Transdisciplinarity complements disciplinary approaches. It occasions the emergence of new data and new interactions from out of the encounter between disciplines. It offers us a new vision of nature and reality. Transdisciplinarity does not strive for mastery of several disciplines but aims to open all disciplines to that which they share and to that which lies beyond them.

Article 4:

The keystone of transdisciplinarity is the semantic and practical unification of the meanings that *traverse* and *lay beyond* different disciplines. It presupposes an open-minded rationality by re-examining the concepts of 'definition' and 'objectivity.' An excess of

formalism, rigidity of definitions and a claim to total objectivity, entailing the exclusion of the subject, can only have a life-negating effect.

Article 5:

The transdisciplinary vision is resolutely open insofar as it goes beyond the field of the exact sciences and demands their dialogue and their reconciliation with the humanities and the social sciences, as well as with art, literature, poetry and spiritual experience.

Article 6:

In comparison with interdisciplinarity and multidisciplinary, transdisciplinarity is multireferential and multidimensional. While taking account of the various approaches to time and history, transdisciplinarity does not exclude a transhistorical horizon.

Article 7:

Transdisciplinarity constitutes neither a new religion, nor a new philosophy, nor a new metaphysics, nor a science of sciences.

Article 8:

The dignity of the human being is of both planetary and cosmic dimensions. The appearance of human beings on Earth is one of the stages in the history of the Universe. The recognition of the Earth as our home is one of the imperatives of transdisciplinarity. Every human being is entitled to a nationality, but as an inhabitant of the Earth is also a transnational being. The acknowledgement by international law of this twofold belonging, to a nation and to the Earth, is one of the goals of transdisciplinary research.

Article 9:

Transdisciplinarity leads to an open attitude towards myths and religions, and also towards those who respect them in a transdisciplinary spirit.

Article 10:

No single culture is privileged over any other culture. The transdisciplinary approach is inherently transcultural.

Article 11:

Authentic education cannot value abstraction over other forms of knowledge. It must teach contextual, concrete and global approaches. Transdisciplinary education revalues the role of intuition, imagination, sensibility and the body in the transmission of knowledge.

Article 12:

The development of a transdisciplinary economy is based on the postulate that the economy must serve the human being and not the reverse.

Article 13:

The transdisciplinary ethic rejects any attitude that refuses dialogue and discussion, regardless of whether the origin of this attitude is ideological, scientific, religious, economic, political or philosophical. Shared knowledge should lead to a shared understanding based on an absolute *respect* for the collective and individual Otherness united by our common life on one and the same Earth.

Article 14:

Rigor, *openness*, and *tolerance* are the fundamental characteristics of the transdisciplinary attitude and vision. *Rigor* in argument, taking into account all existing data, is the best defense against possible distortions. *Openness* involves an acceptance of the unknown, the unexpected and the unforeseeable. *Tolerance* implies acknowledging the right to ideas and truths opposed to our own.

Article final:

The present *Charter of Transdisciplinarity* was adopted by the participants of the first World Congress of Transdisciplinarity, with no claim to any authority other than that of their own work and activity.

In accordance with procedures to be agreed upon by transdisciplinary-minded persons of all countries, this *Charter* is open to the signature of anyone who is interested in promoting progressive national, international and transnational measures to ensure the application of these Articles in everyday life.

Convento da Arrábida, 6th November 1994

Editorial Committee

Lima de Freitas, Edgar Morin and Basarab Nicolescu

Translated from the French by

Karen-Claire Voss