Multidisciplinarity, Interdisciplinarity, Indisciplinarity, and Transdisciplinarity: Similarities and Differences

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1. Multidisciplinarity, Interdisciplinarity, Indisciplinarity, and Transdisciplinarity

Multidisciplinarity involves studying a research topic in not just one discipline but in several at the same time. Any topic will ultimately be enriched by the incorporation of the perspectives of several disciplines. The multidisciplinary approach overflows disciplinary boundaries but its goal remains limited to the framework of disciplinary research.

Interdisciplinarity concerns the transfer of methods from one discipline to another. Like multidisciplinarity, interdisciplinarity overflows disciplines, but its goal still remains within the framework of disciplinary research.

Transdisciplinarity concerns that which is at once *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.[1]

One approach to transdisciplinarity is characterized by the refusal to formulate any methodology and by its exclusive concentration on the cooperative solving of problems pertaining to the science-technology-society triad. This approach was principally expressed at the transdisciplinary conference held in Zurich in 2000.[2] While this version of transdisciplinarity does not exclude the meaning "beyond disciplines," it reduces it to the interaction of disciplines with social constraints.

Another interesting approach, developing in the field of art, is that of *indisciplinarity*.[3] "Indisciplinarity" denotes the transgression of disciplinary boundaries; it is therefore closely related to transdisciplinarity. However, the refusal of any methodology, evident in some of the work produced by indisciplinarity, makes it more of an anarchical form of knowledge.

1 Basarab Nicolescu, *La transdisciplinarité, manifeste* (Monaco: Rocher, 1996). Translated into English by Karen-Claire Voss as *Manifesto of Transdisciplinarity* (New York: SUNY Press, 2002).
2 Julie Thompson Klein et al., ed., *Transdisciplinarity: Joint Problem Solving among Science, Technology, and Society—An Effective Way for Managing Complexity* (Basel: Birkhäuser Verlag, 2001).
3 Thomas Mitchell, "Interdisciplinarity and Visual Culture," *Art Bulletin* 77, no. 4 (1995): 540–44.

The above formulation of transdisciplinarity is both unified (in the sense of a unification of different transdisciplinary approaches) and diverse. Much confusion arises when people fail to recognize 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 (which has to be distinguished from "methods": a single methodology corresponds to a great number of different methods). The word "phenomenology" implies the construction of models that connect the theoretical principles with the previously observed experimental data in order to predict further results. The word "experimental" implies the performance of experiments that follow a well-defined procedure, allowing any researcher to obtain the same results when performing the same experiments.

The reduction of transdisciplinarity to only one of its aspects is very dangerous because it will transform transdisciplinarity into a temporary fashion. The huge potential of transdisciplinarity will never be realized if we do not undertake a simultaneous and rigorous consideration of the three aspects of transdisciplinarity. This simultaneous consideration of theoretical, phenomenological, and experimental transdisciplinarity allows both a unified and non-dogmatic treatment of transdisciplinary theory and practice.

2. Methodology of Transdisciplinarity

A number of important researchers in many countries around the world have agreed upon a methodology of transdisciplinarity that they apply in their research.

The axiomatic character of the methodology of transdisciplinarity is an important aspect. This means that we have to keep the number of axioms (or principles or pillars) to a *minimum*. Any axiom which can be derived from the already postulated ones is rejected.

This axiomatic approach is not new. It developed when disciplinary knowledge acquired its scientific character, with the three axioms formulated by Galileo Galilei in *Dialogue on the Great World Systems*:

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.

It should be obvious that if we try to build a mathematical bridge between science and ontology, we will necessarily fail. 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.

After many years of research, I have arrived at the following three axioms of the methodology of transdisciplinarity:[4]

i. The ontological axiom:
There are, in Nature and in our knowledge of Nature, different levels of Reality of the Object and, correspondingly, different levels of Reality of the Subject.

ii. The logical axiom:
The passage from one level of Reality to another is made possible by the logic of the included middle.

iii. The epistemological axiom:
The structure of the totality of levels of Reality is a complex structure: every level is what it is because all the levels exist at the same time.

The above three axioms give a precise and rigorous *definition of transdisciplinarity.*

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

3. The Ontological Axiom: Levels of Reality

The key concept of the transdisciplinary approach to Nature and knowledge is the concept of levels of Reality. The *levels of Reality* offer the possibility of a new taxonomy of today's more than eight thousand academic disciplines.

Here the meaning we give to the word "Reality" is pragmatic and ontological at the same time. By "Reality" we intend first of all to designate that which *resists* our experiences, representations, descriptions, images, or even mathematical formulations.

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4   See Nicolescu, *La transdisciplinarité, manifeste.*

In so far as Nature participates in the being of the world, one also has to 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: experimental data can ruin the most beautiful scientific theory. (Or to take a more pointed example, collective denial of climate change will not stop warming seas from rising.)

By "level of Reality," I designate a set of systems that are invariant under certain general laws (in the case of natural systems) and variable but robust under certain general rules and norms (in the case of social systems). Two levels of Reality are different if, while passing from one to the other, there is a break in the applicable laws, rules, or norms, and a break in fundamental concepts (like, for example, causality). In this case there is a *discontinuity* in the structure of levels of Reality.

This approach is not hierarchical. There is no fundamental level. Every level is characterized by its *incompleteness:* the laws governing this level are just a part of the totality of laws governing all levels, including perhaps those which remain to be described. 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 that apply regardless of what measuring tools are used to extend these sense organs.

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

Inspired by the phenomenology of Edmund Husserl,[5] I assert that the different levels of Reality of the Object are accessible to our knowledge thanks to the different levels of Reality of the Subject that are potentially present in our being.

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5   See Edmund Husserl, *Cartesian Meditations*, trans. Dorion Cairns (Dordrecht: Kluwer Acadmic Publishers, 1999).

As in the case of levels of Reality of the Object, the coherence of levels of Reality of the Subject presupposes a zone of non-resistance. The unity of levels of Reality of the Subject and this complementary zone of non-resistance constitute 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.

The zone of non-resistance plays the role of a *third* between the Subject and the Object, an Interaction term, which allows the unification of the transdisciplinary Subject and the transdisciplinary Object while preserving their difference. I call this Interaction term the Hidden Third.

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

The transdisciplinary Object and its levels of Reality, the transdisciplinary Subject and its levels of Reality, and the Hidden Third define the transdisciplinary approach 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 organization – 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

4. The Logical Axiom: The Included Middle

The incompleteness of the general laws governing a given level of Reality signifies that, at a given moment in time, one necessarily discovers contradictions in the theory describing the respective level: one has to assert A and non-A at the same time.

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:

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") that is at the same time A and non-A.

Stéphane Lupasco (1900–1988) demonstrated that the logic of the included middle is a true logic, mathematically 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 that is at the same time A and non-A—is completely clarified once the notion of "levels of Reality," a notion absent in Lupasco's work, is introduced.

In order to obtain a clear 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. Of course, this conciliation is only temporary. 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. *Knowledge is forever open.*

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6   Stéphane Lupasco, *Le principe d'antagonisme et la logique de l'énergie: Prolégomènes à une science de la contradiction* (Paris: Hermann & Cie, 1951).

5. The Epistemological Axiom: Universal Interdependence

There are several theories of complexity. In the context of our discussion, it is important to understand that the existing theories of complexity do not include either the notion of levels of Reality or the notion of zones of non-resistance.[7] However, some of them, like that of Edgar Morin,[8] 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 differentiate between *transversal complexity* and vertical, transdisciplinary complexity. Transversal complexity refers to the crossing of different levels of organization at a single level of Reality. From a transdisciplinary point of view, complexity is a modern form of the very ancient principle of universal interdependence.

6. Conclusions

A unified theory of levels of Reality is crucial in building sustainable development and sustainable futures. The considerations made until now in these matters are based upon reductionist and binary thinking: everything is reduced to society, economy, and environment. The individual level of Reality and the cosmic level of Reality are completely ignored. Sustainable futures, so necessary for our survival, can only be based on a unified theory of levels of Reality. The ideology of scientism could lead to the self-destruction of our species.[9]

Reality is plastic. Reality is not something outside or inside us: it is simultaneously outside and inside. We are part of this Reality that changes due to our thoughts, feelings and actions. This means that we are fully responsible for what Reality is.

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7   Paul Cilliers and Basarab Nicolescu, "Complexity and Transdisciplinarity: Discontinuity, Levels of Reality and the Hidden Third," *Futures* 44, no. 8 (2012): 711–18.
8   Edgar Morin, *La méthode,* 6 vols (Paris: Seuil, 1977–2001).
9   Paul Ehrlich and Anne Ehrlich, "Can a Collapse of Global Civilization Be Avoided?" *Proceedings of the Royal Society of Biological Sciences* 280, no. 1754 (2013). doi: 10.1098/rspb.2012.2845.