

Being Transdisciplinary

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ATLAS 



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The Academy of Transdisciplinary Learning & Advanced Studies



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Preface

The present book shows that transdisciplinary international movement arrived at its maturity and new important avenues of research and action are opening. The contributions are written by authors (ranging from famous transdisciplinary researchers till PhD students) coming from a large variety of fields of knowledge.

The title “Being Transdisciplinary” of the book is like a Zen koan: it has multiple meanings, depending on the level of understanding of the reader. The first meaning of “Being Transdisciplinary” is the Being of Transdisciplinarity, i. e. the Being of the unity of Nature and knowledge. The second meaning of “Being Transdisciplinary” is the Being of the transdisciplinary researcher. The transdisciplinary researcher is not separated from what he or she knows: he or she is part of the knowledge. The third meaning of “Being Transdisciplinary” is to face the challenges of the present world in all their complexity.

It is only through the unification of the above three meanings of “Being Transdisciplinary” that methodology of transdisciplinarity will be the keystone of facing the challenges of the 21st century. Transdisciplinarity is today a realistic hope for humanity.

Basarab Nicolescu

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OPENING Address

Being Transdisciplinary, as Keystone of Facing the Challenges of the 21st Century

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Transdisciplinarity¹ has already a quite long history . The word itself was coined in 1970 by Jean Piaget. I formulated the methodology of transdisciplinarity in the period 1985-1990 and its full formulation was given in my book *Manifesto of Transdisciplinarity*, in 1996.² Since then, a lot of applications were done all over the world in education, health, sustainable development and the dialogue between science and religion. PhD programs in transdisciplinarity exist now in several important universities.³

Today, one can assert that the international movement of transdisciplinarity arrives at its maturity and new avenues of research are opening in connection with the recent understanding of the connection between the natural information and the spiritual information through the Hidden Third.

This explains why we have chosen “Being Transdisciplinary” as title of our congress. “Being Transdisciplinary” is like a Zen koan: it has multiple meanings, depending on the level of understanding of the reader.

The first meaning of “Being Transdisciplinary” is the *Being of Transdisciplinarity*, i. e. the Being of the unity of Nature and knowledge. It is a philosophical meaning, independent of any religious interpretation. The Being of the unity of Nature and knowledge means what crosses the region of

¹Basarab Nicolescu, “Brief Chronology of Transdisciplinarity” http://ciret-transdisciplinarity.org/ARTICLES/Brief_Chronology_of_Transdisciplinarity.pdf accessed on October 16, 2018.

²Basarab Nicolescu, *La transdisciplinarité, manifeste*, Rocher, Monaco, 1996. English translation: *Manifesto of Transdisciplinarity*, State University of New York (SUNY) Press, New York, 2002 , translation in English by Karen-Claire Voss.

³<http://ciret-transdisciplinarity.org/doctorat.php> accessed on October 16, 2018.

resistance of all levels of Reality of the Objects and of all levels of Reality of the Subject through the region of non-resistance of the Hidden Third. Transdisciplinary methodology succeeds to unify the Real and the Reality, through a rigorous interconnection of ontology, logic and epistemology.

The second meaning of “Being Transdisciplinary” is the *Being of the transdisciplinary researcher*. The transdisciplinary researcher is not separated from what he or she knows: he or she is part of the knowledge. Neutrality and strict objectivity in knowledge is just a phantasm of the classical thinking, in contradiction with the interpretation of the theories and data of contemporary science. This involves necessarily a spiritual evolution of the researcher, enabling him or her to embody the unification of the Subject and of the Object through the action of the Hidden Third. Only in such a way the transdisciplinary researcher can enter in dialogue with the Being of the unity of Nature and knowledge.

The third meaning of “Being Transdisciplinary” is to face the challenges of the present world in all their complexity. We are facing a period of a new barbarism which can be summarized by three words: transhumanism, anthropocene and panterrorism. This new barbarism can lead, for the first time in history, to the total destruction of the human species. Transdisciplinarity has to be deeply and practically involved with planetary and societal problems of today.

It is only through the unification of the above three meanings of “Being Transdisciplinary” that methodology of transdisciplinarity will be the keystone of facing the challenges of the 21st century.

Let me explain you in few words the basic notions of transdisciplinarity. The methodology of transdisciplinarity⁴ is founded on three postulates:

1. The ontological postulate: *There are, in Nature and in our knowledge of Nature, different levels of Reality of the Object and different levels of Reality of the Subject.*
2. The logical postulate: *The passage from one level of Reality to another is insured by the logic of the included middle.*
3. The epistemological postulate: *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 first two postulates received, in the 20th century, experimental evidence from quantum physics, while the last one has its source not only in quantum physics but also in a variety of other exact and human sciences.

The key concept of transdisciplinarity is the concept of *levels of Reality*.

“Reality” first of all designates that which *resists* our experiences, representations, descriptions, images, or even mathematical formulations.

We have to distinguish, in order to avoid further ambiguities, the words “Real” and “Reality”. *Real* designates that which is, while *Reality* is connected

⁴Basarab Nicolescu, Manifesto of Transdisciplinarity, op. cit.

to resistance in our human experience. The “Real” is, by definition, veiled for ever while “Reality” is accessible to our knowledge. Real involves non-resistance while Reality involves resistance.

By “level of Reality”, I designate a set of systems which are invariant under certain general laws (in the case of natural systems) or general rules and norms (in the case of social systems): for example, quantum entities are subordinate to quantum laws, which depart radically from the laws of the macrophysical world. That is to say that 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 (like, for example, causality). Therefore there is a *discontinuity* in the structure of levels of Reality.

Every level is characterized 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 entirety of Reality: we have also to consider the Subject and its interaction with the Object. *Knowledge is forever open*.

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, of our sense organs and of our brain, limitations which apply regardless of what measuring tools are used to extend these sense organs.

The unity of levels of Reality of the Object and its complementary zone of non-resistance constitutes what I call the *transdisciplinary Object*. The levels of Reality of the Object are traversed by *natural information*.

The different levels of Reality of the Object are accessible to our knowledge thanks to 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. In a rigorous way, these levels of perception are, in fact, *levels of Reality of the Subject*.

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 to perception.

The unity of levels of Reality of the Subject and its complementary zone of non-resistance constitutes what I call the *transdisciplinary Subject*. The levels of Reality of the Subject are traversed by *spiritual information*.⁵ Of course, spiritual information can’t be measured by instruments like accelerators, voltmeters, microscopes or telescopes. But it can be experienced by the most complex instrument of measure: the human being in its interiority.

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*.

⁵Basarab Nicolescu, “The Hidden Third as the Unifier of Natural and Spiritual Information”, *Cybernetics and Human Knowing*, Vol. 22 (2015), no. 4, p. 91-99 http://basarab-nicolescu.fr/Docs_articles/CHK_1.pdf accessed on October 16, 2018.

The transdisciplinary Object and its levels, the transdisciplinary Subject and its levels and the Hidden Third define the transdisciplinary Reality.

The Hidden Third between Subject and Object is rational but it denies any rationalization. The Hidden Third is not the opposite of reason: to the extent that it ensures the harmony between Subject and Object, the Hidden Third is part of the new, complex transdisciplinary rationality. The radical discontinuity of the Hidden Third allows the interaction of the natural information and of spiritual information. In such a way, the Hidden Third restores the continuity of Reality.

The human person appears as an interface between the Hidden Third and the world. The erasing of the Hidden Third in knowledge signifies a one-dimensional human being, reduced to its cells, neurons, quarks, elementary particles and electronic chips.

Let me now evoke some new avenues of transdisciplinary research:

1. One important task for future is the *transdisciplinary definition of consciousness*. The past decade has seen several sophisticated models of consciousness, but most of them are reductionist. The transdisciplinary Reality is incompatible with the reduction of the spiritual level to the level of the psyche, of the level of the psyche to the biological level, and of the biological level to the physical level. Spirituality is not just the activity of neurons. The reductionism in the problem of consciousness corresponds to the erasure of the Hidden Third.⁶ I am happy to see that several talks at this congress study the problem of the transdisciplinary definition of consciousness
2. Other important task is the *reshaping of the international institutions in order to face the huge planetary challenges of our century*.

Politicians and leaders of the different countries have to understand that there is an *ontological barbarism* consisting in the desire to reduce everything to a single level of Reality, a logic barbarism consisting in the refusal of any other logic than that of the excluded third, and an *epistemological barbarism* consisting in the refusal of complexity, of the interconnection between different levels of Reality.⁷

The problems of panterrorism and anthropocene cannot be solved by the old political approach, based on dominance, conquest and wars with atomic bombs and artificial intelligence robots as soldiers. Etymologically, the word “barbarian” means one who is a stranger, an alien, who

⁶Arthur Versluis and Basarab Nicolescu, “Conversation between Basarab Nicolescu and Arthur Versluis, Part One: “Spirituality and Transdisciplinarity” <http://www.hieros.world/a-conversation-between-basarab-nicolescu-and-arthur-versluis-part-one/> accessed on October 16, 2018.

⁷Basarab Nicolescu, “The Dark Side of Technological Singularity: New Barbarism”, *Cybernetics and Human Knowing*, Vol. 23 (2016), no. 4, p. 77-83 http://basarab-nicolescu.fr/Docs_articles/CHK_3.pdf accessed on October 16, 2018.

belongs to an uncivilized world. We have to understand that *the alien is not outside us but within us*. We are our own barbarians.

It is very interesting that we planned for our congress a Round Table session on “Being Transdisciplinary in Politics and World Affairs” and nobody registered for this session. It simply means that transdisciplinarity did not penetrate yet in the world of politicians. It is our task for the future to imagine ways for filling this gap.

3. Finally, I recommend to all transdisciplinary researchers to be very active in the *ethical problems connected with transhumanism*.

Artificial intelligence went through tremendous developments in the past years and these developments will be even stronger in the future years. There is, of course, a face of light of the artificial intelligence, especially in the domain of health and world communication, but there also very dark sides, linked to the transhumanist ideology. In spite of their common prefix “trans”, transhumanism has nothing to do with transdisciplinarity.

If the transhumanist project will be achieved, human beings will become increasingly more a machine and the machine will become increasingly more human. The international cultural and intellectual movement of transhumanism advocates the use of biotechnology to improve physical and mental characteristics of human beings. Aging and death are considered undesirable and should not be inevitable. Natural selection is considered to be outdated and it is replaced by technological selection. The major project is to remove any transcendent force and replace it with man-machine with superhuman intelligence, master of his/her life. Transhumans, which some philosophers and ideologists call them, for obvious oratorical precautions, “improved humans” or “ameliorated humans”, will constitute a new, bio-technological species. Future society will be divided between “transhumans” and “old humans”. The old humans will inevitably be servants of the transhumans. Transdisciplinary cannot accept this deep change of human nature and they have to do elaborate studies in order to show all the destructive aspects of transhumanism.⁸

In conclusion, we are at the threshold of a true New Renaissance, which asks for a new, cosmodern consciousness. There are exemplary signs and arguments for its birth, from quantum physics till theatre, literature and art.⁹ But, paradoxically, the new Renaissance potentiality is overshadowed by the violence of the new barbarism, a new stage in the confrontation between *Homo religiosus* and *Homo economicus*.

⁸Basarab Nicolescu, “The Dark Side of Technological Singularity: New Barbarism”, op. cit.

⁹Basarab Nicolescu, *From Modernity to Cosmodernity - Science, Culture, and Spirituality*, State University of New York (SUNY) Press, New York, USA, 2014.

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CHAPTER 2

To be or Not to be Transdisciplinary, That is the New Question. So, How to be Transdisciplinary?

Florent Pasquier¹ and Basarab Nicolescu², ¹ Sorbonne University, UTC and International Center for Transdisciplinary Research and Studies (CIRET), Paris, France; ² Faculty of European Studies, University Babeş-Bolyai, Cluj-Napoca, Romania and International Center for Transdisciplinary Research and Studies (CIRET), Paris, France

*C*enturies ago Hamlet, the famous character, asked himself a similar question. We now have to deal with the actualization of this fundamental ontological issue: “how to be” (or how not to be). Why. The difference is that in ancient times, humanity could have a long-term vision of its development (the planet earth was mostly unknown by Europeans). This is a vision we don’t have anymore, as the anthropocentric period will collapse soon if humanity does not change its beliefs and way of life. Where. Since Shakespeare, the world has become a small village through globalization and the increase of all kinds of networks. So the question still remains valid anywhere on our planet, and even in outer space, where some futurologists plan a possible (and non-sensical) human extension. Propositions to discuss. We should try to answer this question by beginning here and now, as sciences and the world’s traditional wisdoms agree that all issues start from the inner self of each human being. So we have to increase knowledge by conducting research both in human sciences (philosophical and practical) and fundamental sciences (theoretical and applied). How. Certainly, each one of us tries to be a good human being... but we also must not forget that we are not alone, which means we also have to learn how to live better all together. This brings us to translate the question from just a personal position (point of view) and instead in its collective and social dimension. It means the whole thing might become a question of education: we probably have to (re)-invent a new pedagogy. It should include: transdisciplinary approach, complex thinking process, transpersonal psychology, soft skills, consciousness, spirituality (not to be confused with religion)

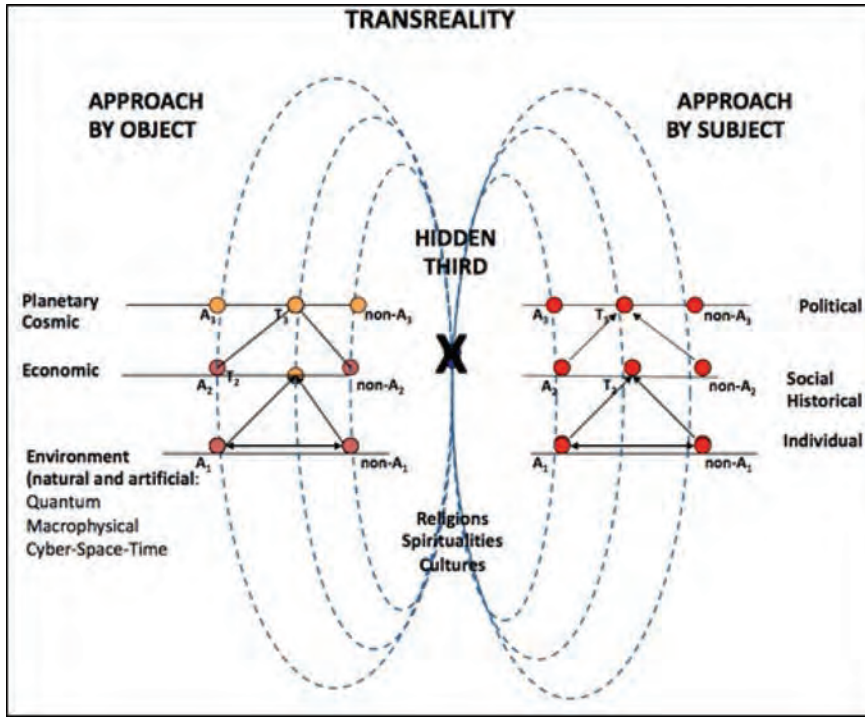


Figure 2.1: Transreality.

etc. The use of (always) new technologies must be part of this investigation, as they can increase our awareness and consciousness, creating a new field called technontologies (i.e. technics + ontology). Then, we will approach a transdisciplinary paradigm for our personal and collective lives, for a future of hope and fair sharing of the only planet we collectively need to take care of. Therefore we need work together to find the answer to this question: “how to be transdisciplinary”?

Keywords: Being transdisciplinary, subjects and objects, how to be transdisciplinary, transreality, axioms of transdisciplinarity, levels of Reality, Hidden Third.

Centuries ago Hamlet, the famous character, asked himself a similar question. We now have to deal with the actualization of this ontological and fundamental issue: “be and how to be” (or how not to be).

The difference is that in those ancient times, humanity could have a long-term vision of its development (the planet earth was mostly unknown by Europeans). This is a vision that we do not have any more, as the anthropocene period will lead to a collapse soon if humanity does not change its beliefs and

way of life.

In contrast to Shakespeare's time, the world has become now a small village through globalization and countless networks. So the question still remains valid anywhere on our planet, and even in outer space, where some futurologists plan a possible (and non-sensical) human extension.

We should try to answer this question by beginning here (and now), as the world's traditional wisdoms agree that all issues start from the inner self of each human being. So we have to increase knowledge by conducting research both in human sciences (related to subjects) and fundamental sciences (related to objects).

Certainly, each one of us tries to be a good human being, but we also must not forget that, as we are not alone, we have to learn how to live all together. This brings us to ask the question "*How to be transdisciplinary*" from not just a personal position, but a collective and social dimension.

We proceed in this way by starting with the diagram of "Transreality"¹ (see Figure 2.1). In agreement with the three axioms of transdisciplinarity,² the Hidden Third³ appears as the interaction of Subject and Object, each constituted from different levels of Reality. We can go from one level of Reality to another level of Reality by using the logic of the included middle,⁴ but this passing crosses the region of the Hidden Third. In the diagram of Transreality we therefore see the entanglement between the logical included middle and the alogical Hidden Third. This entanglement is fundamental for everything which follows in our paper.

The question is to find a theory of action⁵ that allows going from a descriptive mode to a conscious effective mode. We studied in such a way the dynamics of successive and simultaneous transformations, called individual, collective and social transformations.⁶ We propose to study the problem of "development" - human and organizational. Starting from a world incarnated in three levels - the self, others and the nature/world,⁷ we formulate three levels of development: personal development (the self), professional development (the others in a professional context) and collective development (the world). These levels, potentially present in the first diagram, allow *true transdisciplinary discovery* (see Figure 2.2): by superimposing the three zones

¹Basarab Nicolescu, "Transdisciplinary Realism", Cybernetics and Human Knowing, Vol. 23 (2016), Number 2, p. 77-85. http://basarab-nicolescu.fr/Docs_articles/CHK_2.pdf Accessed on October 20, 2018.

²Basarab Nicolescu, *Manifesto of Transdisciplinarity*, State University of New York (SUNY) Press, New York, 2002, translation in English by Karen-Claire Voss.

³Basarab Nicolescu, "The Hidden Third as the Unifier of Natural and Spiritual Information", Cybernetics and Human Knowing, Vol. 22 (2015), Number 4, p. 91-99 http://basarab-nicolescu.fr/Docs_articles/CHK_1.pdf Accessed on October 20, 2018.

⁴Stéphane Lupasco, *Le principe d'antagonisme et la logique de l'énergie*. L'Esprit et la Matière, Le Rocher, Monaco, 1987.

⁵Talcott Parsons, *Action Theory and the Human Condition*. New York: Free Press, 1978.

⁶Florent Pasquier et al., *Réinvestir l'humain: individus, collectifs, sociétés*, Chronique Sociale, 2017.

⁷Pierre Weil, *L'art de vivre la vie*, Rocher, Monaco, 2003.

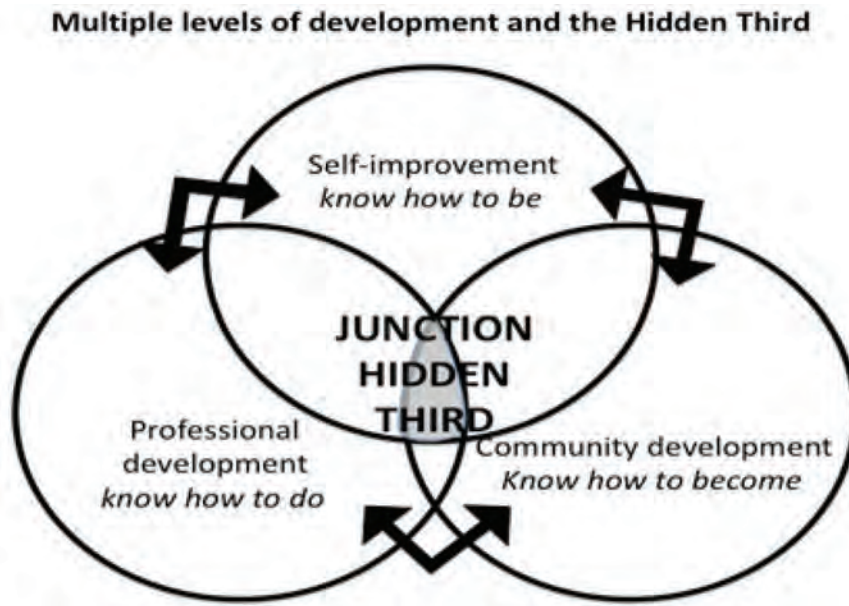


Figure 2.2: Multiple levels of development and the Hidden Third.

of development, we see that there is a zone where they intersect, a zone where appears the important role of the Hidden Third, which is common to the three zones of development. By projecting this triple approach we can position them on a common pedestal which is constituted and constructed on the different levels and structures of Transreality. This pedestal is the common platform corresponding to a specific space-time. It contains individualities and communities such as territories, cultures, material and psychological conditions of existence, societal, affective and financial networks immersed in the Hidden Third. We therefore can discover the dynamical and operator links between human actions and the structure of Transreality (see Figure 2.3). The zones of non-resistance, belonging to the Hidden Third, are accessible through intuition, the imaginary and the imaginal,⁸ activity, lived experience, poetry, dreams.⁹

They connect in a vertical manner the notions of “bottomless”¹⁰ and the ontological dimensions of existence and allow establishing a bridge between interior (the world of subjects) and exterior (the world of objects).

⁸Henry Corbin, “Mundus imaginalis ou l’imaginaire et l’imaginal” in Henri Corbin, *Face de Dieu, face de l’homme, “herméneutique et soufisme”* (Paris: Flammarion, 1983).

⁹René Barbier, *L’approche transversale: L’écoute sensible en sciences humaines*, Exploration interculturelle et science sociale, Paris: Anthropos, Paris, 1997.

¹⁰Cornelius Castoriadis, Johann Michel, Catherine Goldenstein, Pascal Vernay, *Dialogue sur l’histoire et l’imaginaire social*, Collection “Audiographie” 15, Éditions EHESS, Paris, 2016.

Multiple levels of development and link with Transreality

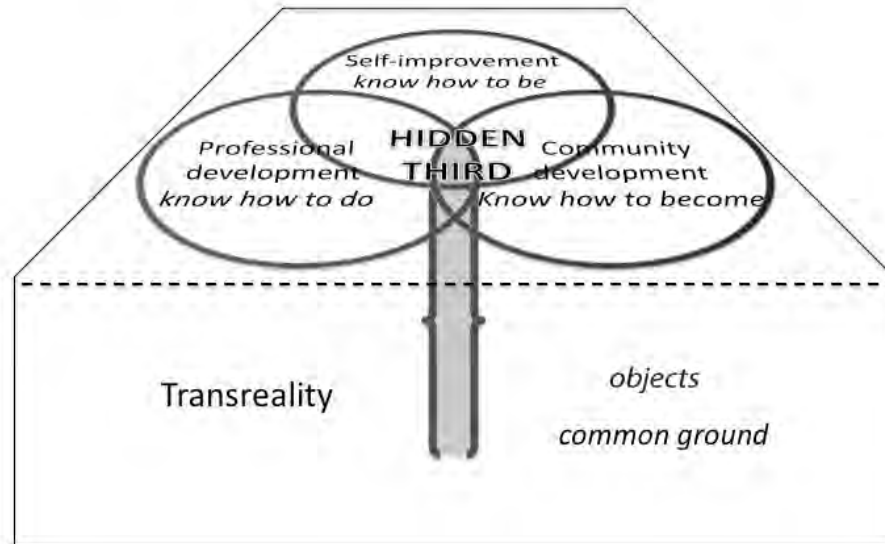


Figure 2.3: Multiple levels of human development and their link with Transreality.

Certain conditions are identified for an optimal functioning of acting in view of a real reciprocal influence between subjects and objects.

First of all, there is the condition of the search of a harmonious equilibrium between the three types of development

Also, there is the condition of the intentionality of the centripetal unification of these three domains, in order that everyone benefits from the others and there is sharing instead of separation.

Finally, we must pursue a deep analysis of the implicated subjects and subjects, in order to verify the consistency and the capacity of orientation towards the aims to be attained, by introducing the notion of “temple”, as we will see in the following.

Then we can explore the coherence loops and the horizontal and sustainable self-consistency, allowing the instauration of a vertical trans-reductionist circulation of the information, of the “black hole” type, overcoming the resistance and the discontinuity of the classical paradigm (theories and discourses based in reason and classical logic). We can therefore envision a principle of unification of the world of objects with the world of subjects or of a vortex of

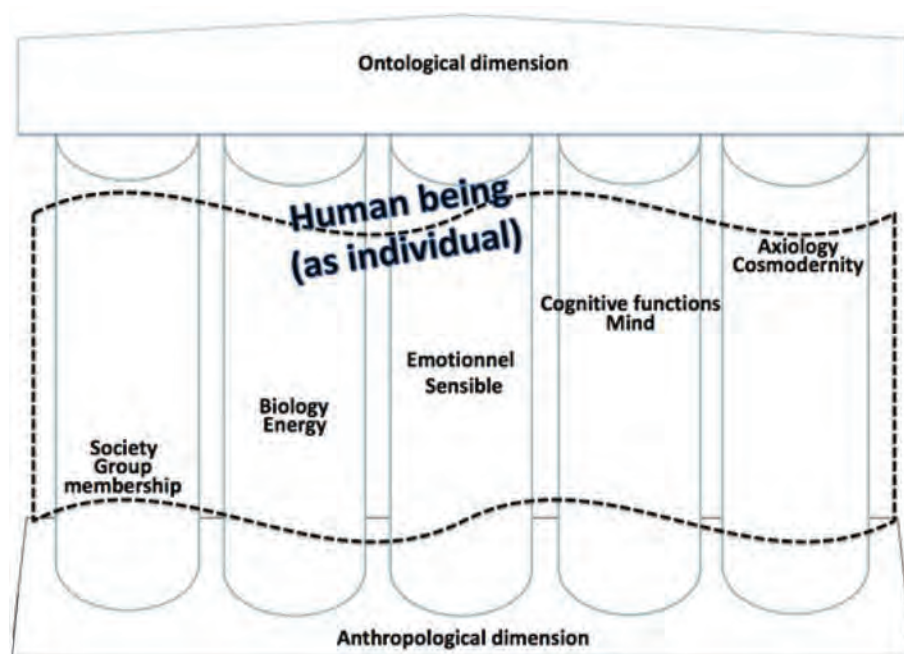


Figure 2.4: Simple human temple.

the “white fountain” type.¹¹ This is the real place of action, of passing from a voluntary, potential act towards actualization: the apparent dialectic mirror opposition subject/object fuses at this point of unification. As Krishnamurti¹² say “the observer is the observed”.

Does this mean that everything becomes reduced to education and education policies? If this is the case, we must face the question: what type of education and with which conception of human being? What is our vision of a human being as an individual person?

The aim of our proposal is consider the human being as a human temple, a whole being in a holistic approach (see Figure 2.4).

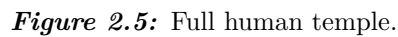
By attaching ourselves to the action of the subject and by taking into account that everything is centered on the self, we examine the deep relation between material aspects to more subtle aspects and argue that every part depends on the other parts,¹³ namely:

1. Each new born human grows up in a specific anthropologic context: beliefs, culture, social organization, economy, i.e. what we call Transreality

¹¹Florent Pasquier, “Le temps et l’espace à l’école en France, entre trou noir et fontaine blanche”, conference given at the workshop “L’école sans murs”, Université Paris 8, 2013.

¹²J. Krishnamurti, *Réponses sur l’éducation*, Bartillat, Paris, 2006.

¹³Florent Pasquier, “Espiritualidad y educación”, in *Ser cambio educativo / Las sociedades necesitan una ciudadanía global*, 186 93, Rizomatrans, Florida universitària, 2016.



2. The first pillar deals with the family and social group's links.
3. The second one deals with the body.
4. The third one is about feelings and sensibility.
5. The fourth one concerns the mental functions (cognition and mind)
6. The last pillar is about values.
7. The top of the temple concerns ontological questions.

Each of the above 7 levels includes and develops parts of the other 6 levels. We can in this way identify the basic scheme in different fields, as in curricula and disciplines. In this approach, “transdisciplinarity” appears in the 5th column and then crosses immediately all the levels and disseminates through the whole structure.

So, here is our answer to the question “how to be transdisciplinary?”: we have to focus simultaneously on scientific knowledge and on the humanities, and the key for this is are “consciousness” as a trend and “intention” as a tool

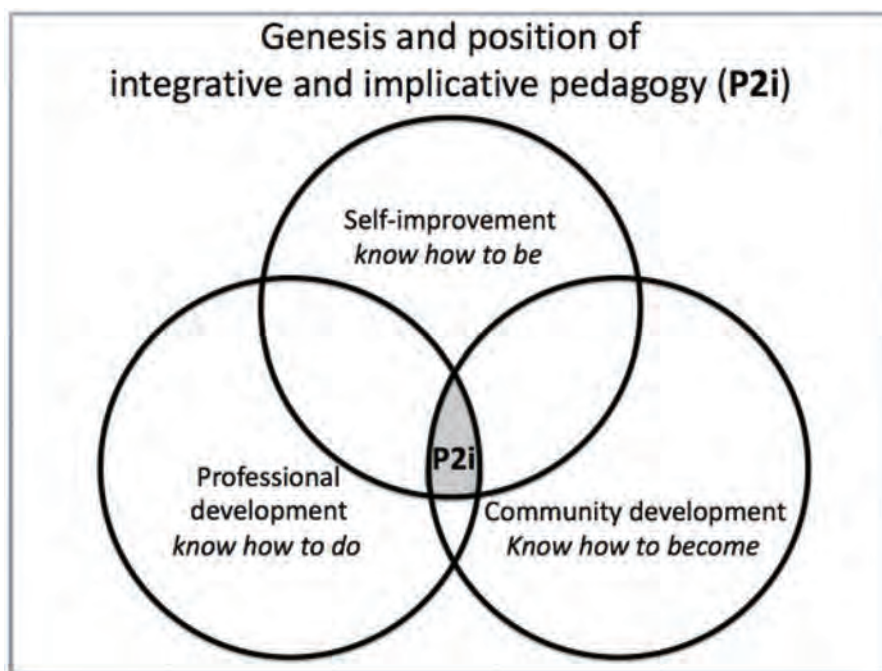


Figure 2.6: The Hidden Third as source of integrative and implicative pedagogy.

for evaluation.¹⁴

What kind of pedagogy might promote this vision? What kind of pedagogy shall we use in order to become transdisciplinary in educational policies?

At the crossroads of the Hidden Third containing the subjects in their 3 dimensions of development, linked to the background from the vortex, appears and arises the place for the manifestation of such pedagogy (see Figure 2.6). So this pedagogy must be elaborated according to personal, collective and social development research: it might focus on the junction of “know how to do”, “know how to be” and “know how to become” while pursuing at the same time emancipation and direct participation to the common ground.

We propose a pedagogy called “integrative” and “implicative”. *Integrative* means that every form of transmission is useful depending on the moments and the contexts. *Implicative* signals that pupils are offered situations to become fully actors of the process of their learning.

What kind of consciousness is able to conduct this transdisciplinary pedagogy?

¹⁴Arthur Versluis and Basarab Nicolescu, “Conversation between Basarab Nicolescu and Arthur Versluis”, Part One: “Spirituality and Transdisciplinarity” <http://www.hieros.world/a-conversation-between-basarab-nicolescu-and-arthur-versluis-part-one/>, accessed on October 20, 2018.

We must distinguish “natural information” from “spiritual information” and we have to join them through the transdisciplinary methodology.¹⁵

For this we can use information and communication technologies (ICT) but under some conditions. “Costech laboratory” (“Knowledge, organization and technical systems”), at the Technological University at Compiègne in France,¹⁶ promotes this approach, by questioning methods and processes and not only objects. This means having a reflection not only in terms of disciplines, but also in terms of the transdisciplinary/complex approach.

Thus, we have to be very careful about the question of transhumanism.¹⁷ There is here a huge confusion between intelligence and computation abilities. The goal of “technontology” (techno-ontology) is to empower human beings for a better life.

Conclusion

In conclusion, a new pedagogy has to include: the transdisciplinary approach and complex thinking, transdisciplinary consciousness, spirituality, the relation with nature and cosmos, creativity, practice of the arts, transpersonal psychology and soft skills.

The use of new technologies has to be part of this investigation, as they can increase our awareness, creating a new field called technontology (i. e. technique + ontology). Then, we will try to apply transdisciplinarity for our personal and collective lives, for a future of hope and fair sharing of the only planet we collectively need to take care of.

So now, what can we do? We should become members of *trans-communities* that respect and increase the commons good: we must cooperate with artists, engineers, scientific researchers, practitioners, educators and all those who are open-minded regarding the other, to open science to culture, society and spirituality.¹⁸

About the Authors



¹⁵Basarab Nicolescu, “The Hidden Third as the Unifier of Natural and Spiritual Information”, op. cit.

¹⁶<http://www.costech.utc.fr/spip.php?article95>, Accessed on October 20, 2018.

¹⁷Basarab Nicolescu, “The Dark Side of Technological Singularity: New Barbarism”, *Cybernetics and Human Knowing*, Vol. 23 (2016), Number 4, p. 77-83. http://basarab-nicolescu.fr/Docs_articles/CHK_3.pdf Accessed on October 20, 2018.

¹⁸Basarab Nicolescu, *From Modernity to Cosmodernity: Science, Culture, and Spirituality*, State University of New York Press, 2014.

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Thanks for the help for the traduction to Aaron Prevost, Southwestern University, Texas.

CHAPTER 3

Towards a Framework for Transdisciplinary Problem Solving

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We live in trying times because of the rapid convergence of technologies such as artificial intelligence, brain-like computer chips, bio-engineering, intelligent pharmacology. At the same time we live with complex societal problems related to issues including global warming, hunger, and aging. The collision of these factors means that we face many serious ethical issues in our daily lives, which often leads to a myopic and self-centered view of the world. Indeed, as we struggle to balance our own dreams and needs, we often forget that we are members of the whole. This article is an attempt to use a transdisciplinary approach to tackle the complex issues in our world by seeking a methodological framework that uses the best aspects from multiple disciplines. The desired end result is a solution that can bridge the profound (higher consciousness) and the practical (innovation) in a way that empowers us to direct our lives in ways that will honor the whole.

Keywords: Framework for transdisciplinary problem solving, complex issues, consciousness, inner transcendence.

3.1 Introduction – A Tale of Two Kobayashis

In 1978, I was invited to be an honorary research fellow at Fujitsu’s research institute. During my visits to Japan I had the opportunity to meet many wonderful Japanese leaders. Dr. Tai Yu Kobayashi, former Chairman and CEO of Japanese computer giant Fujitsu Systems, once shared his secret of success with me:

“I get up every morning at 5:00 AM and spend an hour in my Bonsai garden, immersing myself in nature and becoming totally tranquil. I strive to maintain this state of mind throughout the day, which allows me to make decisions without emotional attachment.”

With this serene practice of easing into a calm state of mind every morning, Mr. Kobayashi could see the world with more clarity. With this clear vision he was able to lead Fujitsu to be the first major Japanese company to go global.

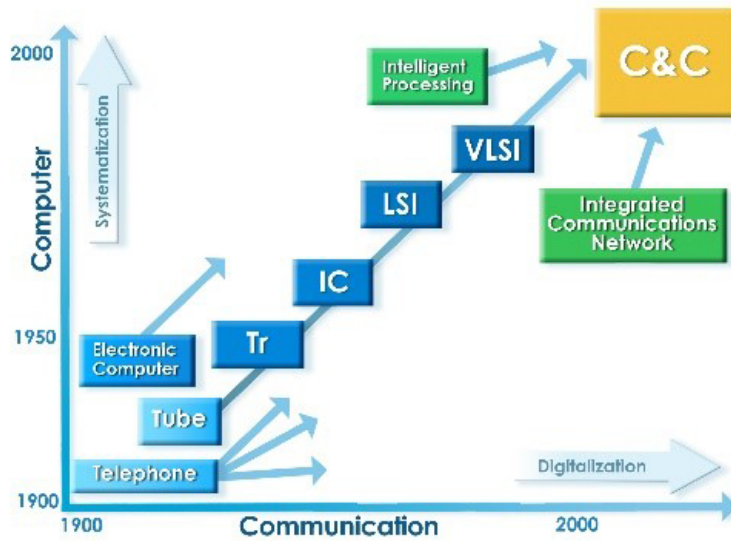


Figure 3.1: NEC's C&C strategic map.

The other Kobayashi I met was Dr. Kanji Kobayashi, long time Chairman and CEO of NEC. The letters NEC stood for Nippon Electric Company, and its primary business was providing electric power. When I asked Dr. Kobayashi to describe the most important decision he made as the leader of NEC, he shared the following with me:

“When I took over as the President of NEC, I made the decision to phase out our business in nuclear reactors. It was clear to me then that the future of NEC must be in the emerging technology areas of computers and communication.”

Kobayashi took a huge risk by steering the company away from its existing energy business, and focusing on the uncertain futures of the two nascent industries. But Kobayashi clearly saw how the computer and communications industries would collide in the coming 30 years, creating huge opportunities for companies poised to exploit the resulting new markets. Kobayashi created a strategic map (the now famous C&C map—see Figure 3.1) to prepare his company for the intersection of the computer and communications. This roadmap identified competencies NEC would need to maximize the potential of the C&C intersection over the next 30 years. The map provided tremendous clarity and focus, helping the company to anticipate the intersection points between the growth of the computer and communications industries. NEC could then proactively create products and services to serve those points of intersection. The map defined NEC's new “Blue Ocean”¹ strategy by defining a new competitive space, allowing the company to prepare products/services that

¹W. Chan Kim and Renee Mauborgne, *Blue Ocean Strategy*, Harvard Business School Press, Boston, Mass, USA.

took advantage of each new breakthrough in either industry, and empowering the company to be first in those new markets.

While Kanji Kobayashi did not share insights about his inner journey with me, I can imagine the huge internal corporate resistance when he chose to steer the company away from its traditional business, drastically changing the human resource profile in a culture where lifetime employment was taken for granted. He must have had tremendous inner calm to overcome the day to day disturbances created by the company's new direction.

The encounters with the two Kobayashis gave me my first lesson on *transdisciplinary thinking*. Tai Yu Kobayashi showed me how inner transcendence helped him maintain his serene clarity so that he could merge the profound with the daily mundane challenges faced by any corporate CEO. Kanji Kobayashi showed me how disruptive innovation could be derived by leveraging the strengths of two distinct disciplines.

There are three perspectives of our “transdisciplinary problem solving framework”², namely: *historical*, *spiritual/ecological*, and *actionable*. The historical perspective is concerned with the unity of *knowledge*. Specifically, this approach leverages disciplinary knowledge, across time, space, and cultures, which leads to *innovative transformations* as demonstrated by Kanji Kobayashi's 30-year roadmap.

The *spiritual/ecological perspective* is primarily concerned with *inner transcendence* towards higher consciousness and achieving an *expansive worldview*. The result is the eventual transcendence beyond dualisms such as space-time, subject-object, and birth-death, leading to the concept of our *interconnectedness* (*oneness/deep ecology*). Tai Yu Kobayashi's morning meditation, which allowed him to reach the mental tranquility needed to be one with nature, illustrates an approach of transcending to a higher level of consciousness.

The *actionable perspective* is mainly concerned with the unity of actions by bridging the *profound* (such as vision from a higher consciousness) and the *practical* (such as innovations). This approach leads to *responsible living*³ in the sense that the resulting innovation has taken into consideration elements of our surroundings, such as people, community, society, environment, and economy. The famous speech *I Have a Dream*, delivered by American civil rights activist Dr. Martin Luther King Jr. in 1963 is a good example of *responsible living*. Dr. King created a strong social movement that eventually resulted in African-American's gaining equal rights, and, 45 years later, the election of the first African-American President of the United States. While Dr. King's speech is extremely inspiring and powerful, it took countless African-Americans and Caucasians joining the social movement to create these results. One notable Caucasian, United State President Lyndon Johnson, heroically spear-headed the creation of “a great society” to provide the necessary legal foundation for the movement. This is an example of the unity of collective actions by many people, linked across time and space, to honor the *whole*.

This chapter is an attempt to use examples to illustrate how these three approaches can solve problem in a transdisciplinary way. Hopefully, a more systematic methodology will emerge from this initial understanding.

²Deduced from Prof. Basarab Nicolescu's opening remarks at the 2018 ATLAS Conference at Cluj-Napoca, Romania.

³Ronald Epstein, *Responsible Living: Explorations in Applied Buddhist Ethics—Animals, Environment, GMOs, Digital Media, Perfect Paperback*, march, 2018.

3.2 The Historical Perspective

“Give me a lever long enough and a fulcrum on which to place it and I shall move the world.” – Archimedes –

Perhaps the greatest early transdisciplinary was Leonardo da Vinci—a philosopher, scientist, artist, inventor, and designer during the Renaissance. According to Fritjof Capra, “*Leonardo often worked on several projects in parallel, and that in trying to understand a phenomenon, Leonardo would often try to connect it with other phenomena through a similarity of patterns. And when his understanding advanced in one area he would revise his ideas in related areas accordingly.*”⁴

In 1943, Nobel laureate physicist Erwin Schrödinger delivered a series of lectures in Dublin to offer his views on how physics could shed light on the puzzling ability of living organisms to maintain molecular order and organization in the face of what seemed to be the randomizing forces of nature. Schrödinger’s lectures were collected into the book *What Is Life?*,⁵ published in 1944. It turned out to be one of the most influential scientific books of the twentieth century, attracting scientists from other fields, including physicist Francis Crick and zoologist James Watson. Watson used Schrödinger’s approach to study genetics and the molecular mechanisms, which led to the birth of molecular biology and the subsequent discovery of DNA. Schrödinger’s lectures made the case that profound questions about the natural world are not owned by any single discipline as scholars from different disciplines all have a stake in the future of life.

In 1998, biologist E. O. Wilson published the book titled *Consilience: The Unity of Knowledge*⁶ in which the author discusses methods that have been used to unite the sciences, and might in the future unite them with the humanities. The word consilience literally means a ‘jumping together’ of knowledge, and describes the synthesis of knowledge from different disciplines to create a common basis of explanation.

In 2014, the U. S. National Academy of Sciences published a book titled *Convergence* to promote a strategy that merged life sciences with other fields, including physical, chemical, mathematical, computational, engineering, and social sciences. The goal was to use the convergence of multiple fields to solve complex challenges, and achieve new and innovative solutions. The report summarizes the lessons learned, and provides organizations with strategies to tackle practical needs and implementation challenges.

These short surveys hopefully provide sufficient evidence about the importance of *leveraging* the knowledge/practices of different disciplines so that meaningful innovations or transformations can emerge, as suggested by Archimedes centuries ago.

Not surprisingly, effective leaders have been using transdisciplinary thinking for centuries. During the Three Kingdom era (220-265A.D.) in China, General Kung Ming battled the Wei army across a river. One day, the officer in charge the front line reported the bad news to Kung Ming that his army had run out of arrows, and replenishment supplies were delayed. To tackle this urgent problem, Kung Ming needed to leverage all his assets to survive the battle. He noted that the weather had been foggy in the mornings. After some thought, he suggested borrowing some arrows from the enemy across the river. Early next morning, he launched an armada

⁴Fritjof Capra, *Learning From LEONARDO – Decoding the Notebooks of a Genius*, Berrett-Koehler Publishers, Inc. San Francisco, 2013.

⁵Erwin Schrodinger, *What is Life?* Amazon.com, ISBN-13: 978-1107604667.

⁶Wilson, E.O. *Consilience: The Unity of Knowledge*, Vintage Books, NYC, NY, 1988.

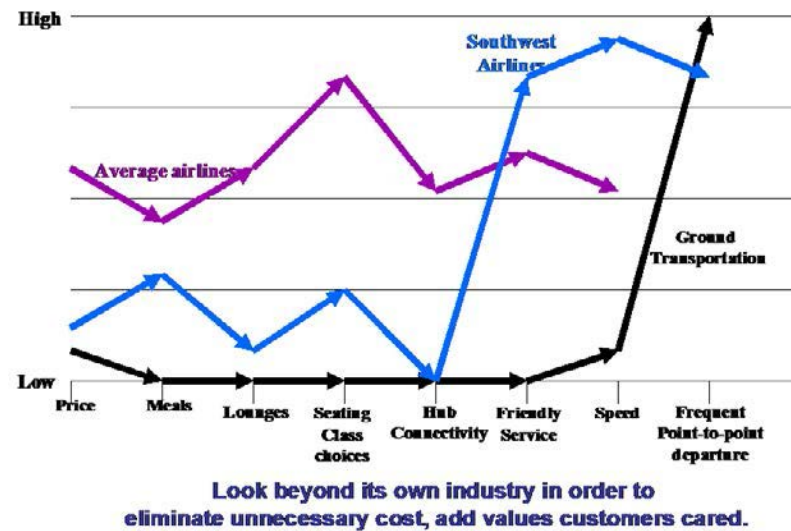


Figure 3.2: SWA's strategy.

across the river in the fog toward the enemy camp, with each boat filled with straw men dressed as soldiers. Predictably, the enemy shot waves of arrows at the straw men, which looked like real soldiers in the fog. By mid-morning, Kung Ming's navy returned with tens of thousands of arrows—gifts from the enemy. Kung Ming's success was based on his ability to leverage the foggy weather as well as the psychology of the enemy to shoot arrows any time the enemy approached.

The contrarian airline, Southwest Airlines (SWA), offers a modern example about the success of transdisciplinary thinking. Herb Kelleher, co-founder of SWA, expressed his philosophy of always being alert and utilizing resources efficiently by saying:

“Think small and act small, and we will get bigger. Think big and act big, and we will get smaller.”

Put another way, when a leader thinks small, he or she must leverage all the available forces. When SWA began operations, the goal was to provide high quality service to customers while charging low prices so that many more people could afford fly. As a small start-up company, SWA could not afford the extra services offered by other airlines, such as airport lounges, meal services, or gates in major airports. SWA used transdisciplinary thinking to create forces that could be leveraged. For instance, SWA's top management studied the ground transportation systems, and then modeled the same system in the airline market. By leveraging the ground transportation model, SWA chose to become a create a new “strategic canvas”⁷ as shown in Figure 3.2. SWA became the first airline to forsake the spoke-and-hub system, occupy gates in smaller regional airports, discard the notion of assigned

⁷W. Chan Kim and Renee Mauborgne, *Blue Ocean Strategy*, Harvard Business School Press, Boston, Mass, USA.

seating, and serve no meals. By promoting efficiency, cutting costs, and keeping things simple, SWA is able to turn its airplanes around much faster than other airlines. As such, SWA transforms its competitors' assets, including large fleets of mixed airplanes and the spoke-and-hub system, into disadvantages.

Two other modern examples of leverage, both in the music industry, are worth mentioning. The first music revolution of *portable music*, Sony's *Walkman*, and the 2nd music revolution, Apple's *iPad*, both provided users with an easy to use method for music discovery and delivery on portable devices. Both companies leveraged multiple technologies to create their ground-breaking music delivery systems. It is interesting to note that Sony, which is very proud of being an innovative organization, did not detect the potential leverage points for the 2nd music revolution.

Consider another story:⁸. "In 1869, the presidents of the Union Pacific and Central Pacific railroads met in Promontory, Utah, to drive the ceremonial spike that connected their railroads. That made transcontinental railroad travel possible, for the first time." What if railroad tycoons thought of their business as the transportation business rather than railroad transportation business? They probably would own the airlines and the truck/auto business as well today.

But the above stories are not immediately useful for daily use as most of us are not able to break down our "associative barriers."⁹ To see far enough to replicate one's own transdisciplinary market disruption, one needs to transcend to higher levels of consciousness.

3.3 The Spiritual/Ecological Perspective

"No problem can be solved from the same level of consciousness that created it." – **Albert Einstein** –

According to Capra, Leonardo Da Vinci always put life at the center of his work, recognizing the fact that "*all-natural phenomena are fundamentally interconnected and interdependent.*" Indeed, Da Vinci emphasized the point when he commented, "*One who does not respect life does not deserve it.*"¹⁰ With such an expanded world view, Da Vinci pursued scientific and engineering work to honor nature rather than dominate it as Francis Bacon did a century later. Bacon's influence of a self-centered bottom-line thinking continues to dominate our society today with a focus on *expansion, competition, quantity, and domination*.

Returning to the SWA example, one can see that the heart of SWA's success is its vision "*to free the sky*" so that everyone can fly. To achieve this goal, the airline must have low fares, as well as provide high quality service. To offer low fares, SWA leveraged the ground transportation's point-to-point strategy as mentioned previously.

The foundation of SWA's success is the Yin and Yang of its culture. SWA's culture is based on the *whole person* concept. This concept contains two seemingly opposing forces: *freedom and accountability fueled by trust*. This means each

⁸Robert Block, "The Many Ways of Thinking", talk presented at the ATLAS conference 2016, China

⁹Frans Johansson, *The Medici Effect*, Harvard Business School Press, 2004, Boston Massachusetts.

¹⁰Fritjof Capra, *Learning From LEONARDO – Decoding the Notebooks of a Genius*, Berrett-Koehler Publishers, Inc. San Francisco, 2013.

employee has the *freedom* to act as he or she thinks is best. At the same time, employees remain accountable for their actions, based on a sense of trust between company and employee. This culture allows each employee to truly be and act as a whole person rather than as a cog in a machine governed by rules and regulations. Indeed, I was totally charmed the first time I strolled through the SWA headquarters on Love Field airport in Dallas. The walls were filled with captivating photos, news clippings, articles, letters, and mementos of employees at various company events. Unlike headquarters of many the Fortune 500 companies, characterized by marble floors and works of original art, the SWA corporate headquarters felt like a big family room filled with the love and warmth emanating from the family photos.

At SWA there exists a rare covenant between company and employees. SWA provides a meaningful cause, great freedom and flexibility, a fun atmosphere, and excellent benefits. SWA employees provide hard work, dedication and, most of all, accountability and responsibility for their own actions. In a world in which employees no longer expect companies to take care of them and companies no longer expect employee loyalty, such a bond of mutual trust is a rare and precious asset. It's easy to see the many expressions of that trust everywhere in the SWA culture. For instance, the airline grants its employees great flexibility in creating their own work schedules. Within each employee work group, people can adjust shifts and days off, or trade work days with each other. In addition, employees have complete freedom to act and make decisions to serve and assist customers and other employees.

Once employees are part of the family, they are always part of the family. Can a company as large as SWA really be one big, happy family? Absolutely! Nothing less would produce the hardworking, fun loving, dedicated workforce that strives heroically on a daily basis to fulfill their vision of freedom in the skies. For employees, becoming an integral part of the SWA family not only gives their work meaning and fun, but it gives them the freedom to be who they are. As a result, the division between work life and family life becomes blurred. Family problems become a part of the tapestry and culture of the airline. The company exerts itself to help employees with family problems, often taking the initiative without being asked. Says Kelleher:

*"We get thousands of notices about something serious that has happened to a family member. Everybody at Southwest Airlines pitches in instantaneously. That's the way we are. We get tickets for relatives to fly in when someone appears to be terminally ill—don't ask, just go do it."*¹¹

3.4 The Actionable Perspective

"Whatever befalls the earth, befalls the sons and daughters of the earth. Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself." – **Ted Perry, inspired by Chief Seattle** –

Consider again the SWA story from the perspective of the above quote. When SWA built its corporate headquarters in Dallas, Texas, Kelleher appointed himself a windowless office away from a corner. Though flamboyant and often loud by nature, Kelleher is nevertheless humble at heart. Throughout his professional life, he has

¹¹Raymond T. Yeh and Stephanie Yeh, *The Art of Business*, Zero Time Publishing, 2004, Olathe, Co. USA.

held true to the early values he gleaned from his mother, always treating each person as an equal. At SWA, Kelleher does not differentiate people by the positions they hold, choosing instead to honor the sacredness of each person as a human being. Says Kelleher, “It’s very important to value people as individuals.”

Before the tragic events of September 11, 2001, Southwest Airlines (SWA) was the sixth largest airline in the U. S. Only one year later, SWA was “valued at \$10.8 billion”, more than all the other majors combined.¹² Perhaps what is most revealing about SWA were Kelleher’s thoughts right after the tragedy. Kelleher recalls:

“The first thing on my mind, quite honestly, was the well-being of our crews and our passengers. Are we getting the airplanes down safely? Do we know where everyone is? Are we taking care of them? The second thing was, just instantly, this is an economic catastrophe which is going to have widespread effects for a long time to come and survivability is going to depend on cash. So cash is king! Forget profitability. Get all the cash that we can, so we went out and borrowed a billion dollars because I figured this was going to be a war of attrition. Whoever had the most cash could last the longest.”

Driven by its vision of freeing the sky and its whole person trusting culture, Kelleher led SWA with a value-centered culture that has always provided job security for employees. This establishes a collective identity for the airline’s 36,000 employees, bridging the divide of work and family, and creating a principle-based relationship. The concern for survivability led to its unusual “filling in” market strategy. SWA simultaneously does the following in new markets:

- Lowers the fare while increasing the number of flights to *saturate* the market.
- Maintains a service mentality and long-term partnership with all of its extended families based on inclusion
- Focus on low cost, speed, high quality service, flexibility, and simplicity. For instance, SWA uses only one kind of airplanes (B737), which means a shallow learning curve for staff, lean maintenance costs, and fast turn times at the gate.

Taken together, these factors create a tipping point, known as the *Southwest Effect*¹³ (see Figure 3.3) that have propelled SWA to become one of the most successful airlines today.

We may call the SWA example a *back from the future or enlightened* approach in the sense that when one is on top of the mountain, it is clear where one needs to go. However, when we cannot see the future clearly we need to use the *incremental* approach, learning our way to future as we plow slowly ahead on a winding country road.

Grameen Bank is an organization that has been astoundingly successful using the *incremental* approach. Grameen Bank pioneered the approach of Micro Lending for the Poor. During the famine of 1974, Muhammad Yunus, a Professor of Economics at the University of Chittagong, was shocked at the utter devastation he found in the villages situated around the University. He came to understand that the poor people in these villages were committed to a form of labor, or slavery, in which they traded their labor for a mere 22 cents per day, barely enough for survival. This cycle continues day in and day out, from one generation to the next. Yunus recalls:

¹²Ibid.

¹³Ibid.

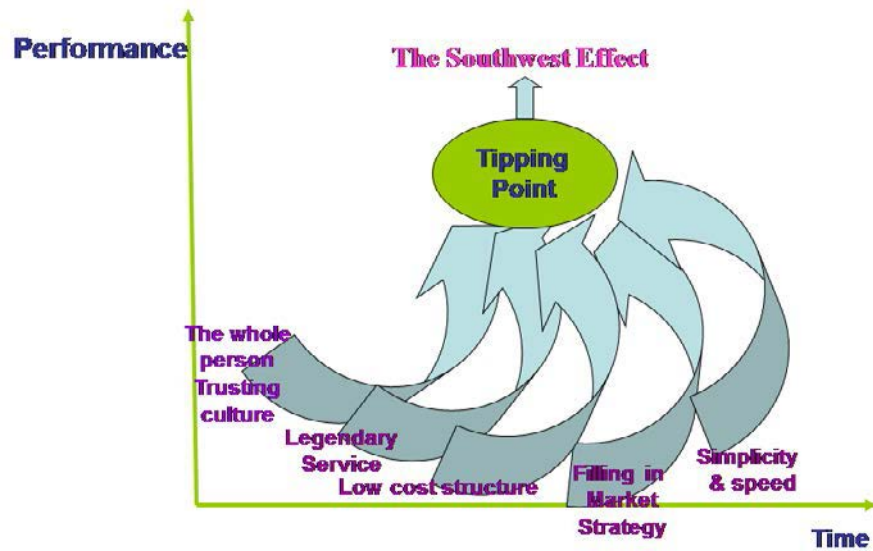


Figure 3.3: The SWA Effect.

“I never heard of anyone suffering for the lack of 22 cents. It seemed impossible to me, preposterous.”¹⁴ He personally lent the equivalent of \$27 to 42 people, which amounted to about 62 cents per person. With this money, each person bought materials for the day’s work, weaving chairs or making pots. At the end of their first day as independent business owners, each of the 42 people sold their wares and paid back the loan. With this understanding and success, Yunus went to the bank to persuade the bankers to help a whole village. The bankers were not willing to make such loans, because “poor people do not have *credit*.” However, with Yunus willing to co-sign the loan, Micro Lending helped a whole village with resounding success. Yet, despite this success, the bankers remained unable to break away from their associative banking barrier that “poor people do not have credit,” and remained generally unwilling to loan money to poor people. To solve this problem, Yunus, together with a group of like-minded colleagues and students, formed Grameen Bank (the word Grameen means “village”) as a micro-lending organization dedicated to lifting the poor out of the perpetual cycle of poverty.

Grameen Bank was created out of the deeply held belief that the poor are as trustworthy as the wealthy or middle class. By studying the villages around him, Yunus came to understand that the poor are poor not because they are untrained or illiterate, but because they cannot retain the returns of their labor since they have no control over capital. Once they are economically empowered, however, they “are the most determined fighters in the battle to solve the population problem, end illiteracy, and live healthier, better lives.” Grameen Bank considers credit to be a basic human right, and operates on the faith that the poor will repay their debts. Unlike traditional banks, Grameen exists in a counter-culture of its own creation,

¹⁴Yunus, Muhammad. *Banker to the Poor – Micro-lending and the Battle Against World Poverty* 1999, Public Affairs, New York.



As a no-handout, inexpensive program that helps the poor with a hand-up to build businesses, micro credit goes directly to the poor. In contrast to many welfare programs, micro credit actually creates long-term jobs in the villages, and helps women develop confidence and independence in a masculine-dominated culture. The economic multiplier effect of micro lending is significant because the poor reinvest the money they earn back into the local economy, buying basic goods such as food, clothing, and shelter. By limiting the size of the loans to small amounts of money, micro credit institutions are able to avoid borrowers motivated by greed. Now decades later, the practice of micro credit lending has spread to more than 50 countries, including some highly developed countries such as the United States. Furthermore, an unprecedented 98% of borrowers have paid their loans back in full.

It is important to point out that while the 1974 famine served as a triggering event for Professor Yunus to help poor people, it's a long journey to come up with the vision of “*a world that is free of poverty*” and then figure out ways to realize it as illustrated in Figure 3.4. Indeed, it is a journey of both gradual inner transcendence as well as outer transformations via innovations.

The above two examples provide a glimpse of two distinct processes leading to *transcendence inspired transformation*. While Herb Kelleher wanted everyone to be able to fly, Muhammad Yunus, on the other hand, wanted to help “poor people” become full members of the world community. Their journeys remind me of phrases in Robert Frost’s poem: *The Road Not Taken*:

“I shall be telling this with a sigh Somewhere ages and ages hence: Two roads diverged in a wood, and I, I took the one less traveled by, And that has made all the difference.

3.5 Conclusion

We hope to have illustrated with examples in the previous sections that a transdisciplinary approach to problem solving is that of “*inner transcendence inspired outer transformations*.” Put another way, the approach consists of both finding that quietude within to reach a higher level of consciousness with a more expansive world-view, and *leveraging* resources in the environment/disciplines to create innovations that are both transformational as well as responsible. Clearly, we are far from a transdisciplinary problem-solving methodology in terms of how to deal with different kinds of complexity – be it dynamic, generative, or social. We are encouraged, however, with recent development of transdisciplinary sustainable design process such as the comprehensive work by Professor Ertas.¹⁵

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About the Author



Dr. Raymond Yeh taught at several universities for more than 20 years and helped two Computer Science departments to top ten national rankings as chairman of department. He was also the CDC distinguished chair Professor at the University of Minnesota. He holds honorary professorship at five universities. Dr. Yeh is the founding editor-in-chief of IEEE Transactions on Software Engineering and was on the editorial board of various journals. He also founded the Technical Committee on Software Engineering and International Conference on Software Engineering (ICSE) within the IEEE Computer Society.

¹⁵Atila Ertas, *Transdisciplinary Engineering Design Process*, John Wiley & Sons, Hoboken, New Jersey, 2018.

Dr. Yeh co-founded two successful software companies and two professional societies. He has been a consultant to many nations including United Nations, United States, China, Japan, Singapore, Sweden, Taiwan, and works with executives of many leading edge global companies as well as with founders of start-up companies. He has published 10 technical books and coauthored two business books. Dr. Yeh is an IEEE Centennial Medal laureate, and a recipient of the Pioneer in Information Technology Award from the government of Taiwan, among others. He is a fellow of Institute of Electrical and Electronic Engineers (IEEE), the Society for Design and Process Science (SDPS), and a senior research fellow at IC2 Institute at the University of Texas at Austin. Dr. Yeh had been a long term volunteer at the City of Ten Thousand Buddhas, a Buddhist monastery located in northern California since 2003.

CHAPTER 4

Transdisciplinarity at the Boundaries: Exploring a Sylvan Metaphor for Health

Peter J. Whitehouse, *Professor, Case Western Reserve University and University of Toronto; President, Intergenerational Schools International*

Transdisciplinarity is an action oriented intellectual and ethical endeavor to address complex ecological, economic, and political challenges that humans face. Language is viewed as a powerful tool for necessary cultural change. Blending art and science looking for the difficult to define but critically important hidden spaces between apparently rigid conceptual structures is a core of transdisciplinarity. Metaphor is a particular powerful tool for examining boundaries and developing creative blends of structures and processes. Forests are biologically and culturally critical to life on the planet. In this chapter we explore, a performance character named Sylvanus, the Tree Doctor, named after the Roman god of forests and boundaries. We consider the importance of intergenerational learning as a process for deeper reflection on human responsibility over time. Transdisciplinarity is energized by intergenerativity and collective wisdom. Systemic and holistic conceptions of health will be essential for the survival and reinvention of human civilization in better balance with planetary ecosystems.

Keywords: Transdisciplinarity, hidden third, intergenerativity, human sciences, climate change, performance art, tree doctoring, intergenerational learning

4.1 Introduction

The core of transdisciplinarity is a moral and intellectual commitment to the processes of exploring boundaries among academic silos in service of addressing complex human and eco-system challenges [1]. Intergenerativity is the blending of different sources of creativity in order to create novel innovations to address social challenges. Intergenerativity is the energy to go between (inter) in order to go beyond (trans) [2]. Transdisciplinarity recognizes different levels of reality and encourages addressing complexity. This approach also celebrates the so-called hidden third, which can

be manifest as the logic of the included middle and other places of generative uncertainty. The logical boundaries between A and not-A may appear to be clear and fixed and to exclude any middle zone, but transdisciplinarity explores the dynamism of transitions and their possible fuzzy set relationships. Like the fluid boundaries between the Oriental Yin and Yang, black can include white and white can include black. Sexual and gender categories can be much more diverse than purely male and female. By embracing complexity, mystery and awe into our discourse space transdisciplinarity encourages thinking and valuing that transcends pure scientific rationality and admits into discussion the poetic, mystical, and spiritual.

Transdisciplinary attends to the power of language and story embraced by the humanities, as well as the methods of the sciences. Figures of speech, particularly metaphor, are key because such linguistic devices carry one world of meaning into another. They asked us to compare and contrast different intellectual and value domains looking for parallels and divergences. Other forms of metaphor are also studied and employed including auditory and visual. Thus transdisciplinarity encourages the arts to contribute to revealing and understanding complexity. In our techno-scientific world we think of culture change occurring as a result of the rational pursuit of more advanced knowledge. Progress is seen as material. Rather art helps us understand the often-ineffable aspects of our humanity and opens up channels for culture change that the sciences do not. Moreover the humanities and the attendant critical thinking and deeper ethical considerations offer us opportunities to challenge dominant narratives about what it means to be a human being and to make cultural progress [3,4].

The boundaries between art and science represent a particularly important area of exploration for transdisciplinarity. The powers of imagination manifest more through story and image than through scientific method. After all, we write fiction, fantasy, and invented the novel. Transdisciplinarity seeks to understand what art and science contribute that are similar and what are different as expressions of our minds and spirits. Both art and science explore relationships and processes existent in the world, as well as in the human mind. They both attend to the recognition and creation of patterns. The ability to recognize patterns in the world and to manipulate them is a fundamental human capability. Our instinct to find patterns in the world in fact leads us to create some individual mental patterns that may not be evident to all others in the real world or may not exist at all. Cultures share patterns of thinking based on common values. The conversation between subjectivity and objectivity is rich in art, often neglected in science. The exaggerated claims that science is the only true source of knowledge about the world leads to the unwarranted faith that characterizes scientism. Transdisciplinary itself challenges our long-standing separation of the world into dualistic notions of objectivity and subjectivity. The understanding of one of the great mysteries of the universe (at least to our species), consciousness, needs more than the findings of human neurosciences but rather a richer embrace of emergent properties beyond our own individual brains.

Narrative is perhaps the fundamental way in which humans attempt to understand complexity. As mentioned, figures of speech allow us to find or imagine relationships among different sources of generativity and patterns of connections. The failure of science to fully embrace the power of narrative in its methodology is a limitation, particularly when it attempts to translate its inventions and discoveries into a space of innovation that might impact human life. The biomedical sciences are particularly prone to deny the power of narrative. When anecdotes (hidden stories)

are disparaged as forms of knowledge to ignore, we run the risk of so-called epistemological bullying from other forms of knowledge creation. All forms of evidence have both strengths and weaknesses. Randomized controlled studies, for example, can fail in both replication and generalizability, yet they are touted by some as the only true form of health knowledge generation. Wisdom requires balancing diverse forms of evidence relevant to decision making including the use of mixed methods, i.e. combining quantitative and qualitative research methods.

In this article we will summarize and extend a paper presented at the CIRET/Atlas international transdisciplinary conference held in Transylvania in June 2018 at the Babes-Bolyai University. The author both chaired the session on becoming transdisciplinary in the human sciences and presented a paper entitled “Wising up: designing an intergenerational course for the future.” The paper blends autobiography through performance art as one way to address the challenges of global climate change and other social unrest.

Our main character in this paper is the author as Sylvanus, the Tree Doctor [5]. This performance character is an artistic and perhaps also scientific device to help human audiences understand what we can learn about health broadly writ from trees and forests. To be clear this is not the usual use of the term tree doctor as a human who is responsible for the health of trees (an arborist as in a tree surgeon who removes dead branches, for example).

4.2 The Transdisciplinary Nature of Tree Doctoring

4.2.1 History

As a physician, cognitive neuroscientist, psycholinguist, and environmental bioethicist, I have long been curious about the boundaries between art and science and other complex conceptual interfaces like disciplines and professions. My own scientific activities have been inter-and then transdisciplinary from my undergraduate days as a premedical student and psychology major. I have worked in geriatric interprofessional team practices. My artistic interests have been based around photography and music. As my life and career moved through different phases as basic scientist to clinical researcher to public health and intergenerational learning practitioner and advocate, I came to see the arts as more and more important in improving health and changing culture [2, 5]. I saw intergenerative collaborations between art and science as critical.

Hence my quests for understanding of and photographing in nature allowed my performance character as Tree Doctor to emerge starting in 2013 during one of many trips the Muir Woods (a redwood forest and national park in California). However, the Tree Doctor has had rebirths and emergences in the Amazon rainforest and in allegedly haunted forests of Transylvania. The fundamental purpose of performing as a Tree Doctor is to ask the audience what human beings can learn from trees and forests, especially about health. Trees are long-lived, inspiring creatures that are subject to biological diseases as well as human interventions. They teach about life, aging, and death. There are few things more alive than a decaying log.

4.2.2 Name

The Tree Doctor received his/her/its name during a study by the author of human cosmologies and geographies. Sylvanus is the Roman god often identified with forests. In English “sylvan” or alternatively silvan means, relating to the forest so that Pennsylvania is the forest of William Penn and Transylvania means beyond the forest. However, in mythology Sylvanus is not actually just the god of forests but rather of boundaries between forests and other ecosystems, like fields and cities.

4.2.3 Costume

The Tree Doctor appears in costume. I dress in greens and browns, even including personally dyed green shoes. My signature T-shirt is an oak tree with a Yang and Yang symbol embedded in its branches. My usual hat is decorated with the quote of John Muir who said that the best way to understand the universe is to take a walk in a forest wilderness. Occasionally I use props such as a forest green stethoscope, a dryad (tree spirit wood nymph) doll, a replica of a matsutake mushroom, or owl puppets of different ages permitting interspecies and intergenerational conversations as part of the performance.

4.2.4 Locations

The Tree Doctor has performed in art museums, national medical and fundraising meetings, and clinical grand rounds in academic hospitals. At the University of Toronto an intergenerational dance collaborator and a graduate student colleague who studies theater accompanied me. In Cleveland on one occasion I was joined by friends and colleagues who are theater and community arts experts. Sylvanus has also participated in activities through Intergenerational Schools International to support learning about nature and health with children, youth, adults and elders. Intergenerational Schools [12] are based on relationship and narrative learning combined with rich educational experiences in social and natural communities. The three schools in Cleveland have been demonstrated to be valuable to both children and their learning and elders and their sense of purpose and quality of life. Now intergenerational learning programs are emerging in Europe and Asia as well.

4.2.5 Bioscience

Trees offer the potential for teaching us about biology [6,7]. They can be considered metaphorically as part of the respiration of the planet because they complement animals that breathe in oxygen and out carbon dioxide by doing the opposite. The trees play many complex roles in ecosystems, for example in water and nitrogen cycles. They sequester carbon and are one of the sources of fossil fuels including coal and oil. Trees live a long time, up to thousands of years, and their health records recorded in growth rings can help us understand long-term climate perspectives. The forests are homes for many other species. The consequences of commercial deforestation in terms of species extinction and climate change are well known. Human behavior has also altered the pattern of forest fires with devastating effects. Yet wood and paper are still essential materials for human communities.

Trees also relate to our understanding of the information processing sciences. Trees sense changes in the environment, respond to those changes, and communicate

with other species. For example, chemical messengers are often released in response to insect threats to a forest. Trees have an often-ignored hidden life under the ground where they interact both competitively and cooperatively with members of the same species, as well as others, for example fungi [7].

Besides their biological importance and role as teachers about ecosystems, trees are also a rich source of metaphor [8]. Throughout history, treelike structures have been employed to organize concepts- trees of knowledge. Darwin and many others used trees to describe the relationships between living creatures -trees of life. Individual trees tell us about the importance of branching out and seeking illumination through their phototropism (leaves growing towards light). Roots are geotropic (roots grow towards gravity) and can be used metaphorically to promote understanding our connections with the earth and the origins of those connections. Perhaps most critically for our purposes, the relationships between trees and forests demonstrate to human beings the importance of systems thinking i.e. neglecting to “see the forest for the trees” (or for that matter the trees for the forest).

An illustration of this big picture thinking comes from neuroscience where the Nobel Prize winner Ramon Cajal it is said to have developed his pioneering neuronal theory of the organization of the brain based on watching trees and forests pass by as he travelled on a train. He came to realize that the brain (the forest) which appeared whole in the summertime was actually composed of individual trees (neurons) that are more visible as isolated structures in the winter. Neurons also look a bit like trees with branches and roots when stained with silver stains that the Cajal used to map the pattern of neurons in the brain. We still talk of arborization when describing neuronal connections.

4.2.6 Cultural Shadows and Thinking Forest

The cultural evolution of our species evolved from forest based hunter-gatherers, to settled farmers, and now most humans are urban dwelling workers of various kinds. Throughout this cultural change forests played an important part in the conversation about what it meant to be a human in relationship to our place in nature [9]. The earliest surviving mythologies, such as Epic of Gilgamesh in Mesopotamia, as well as later ones in Asia and elsewhere, speak of the power of forests, often manifest in divinities. Trees are very common subject for artistic portrayal and interpretation (see Figure 4.1).

Forests offer profound spiritual experiences manifest in various religious traditions and other practices. Today tree worshipers and other forms of shamanic communication with nature exist in tribes less influenced by Western civilization. Kohn [10] has called in fact for creating an anthropology beyond humans based on the idea that forests think. He suggests thought emerges through visual forms. Although forests clearly process information, it is a matter of definition as to whether they think or not. But what is clear is that forests are included in the thoughts of human beings as they seek to understand the biological and social significant of trees [10].

As human beings cleared forests and continued to do so in order to support agriculture, huge population growth occurred. Major changes occurred in human culture including the development of social hierarchies and complex economies. In this process forests were viewed as powerful sources of mystery, as well as resources. Wood was essential to the built environment of towns and cities and eventually to extensive shipbuilding with consequent interaction among different human groups.



Figure 4.1: Students for the Intergenerational School in Cleveland celebrate learning with elders from Toronto in an arboretum. The Tree Doctor is kneeling center front dressed in camouflage with the wood nymph in his pocket. (photo courtesy of the Legacy Center).

The boundaries between ecosystems, so-called ecotomes, such as those between forests and fields or fields and cities, are places of active biological activity, including the exchange of genetic material and epigenetic factors which affect speciation. Similarly the boundaries between different cultures represent intergenerative zones of cultural evolution. Immigration between national borders creates great tensions that can be both destructive to culture as well as foster innovation. The interactions among different cultural forms of art can also be a source of cultural creativity. This intergenerativity creates biological and cultural diversity. The health of the planet as well as individual human beings depends on relationships and connections among different structures. Trees ask us to look at the importance of the processes of interrelationships not just static structures. Thus Sylvanus the god of boundaries, as manifest in a Tree Doctor character, represents transdisciplinarity.

Trees are important actors in what is called Big History [2]. Proponents of this perspective suggest that contemporary human beings can be guided by a deep understanding of the evolution of the universe and life in it. Starting with the Big Bang over 13.8 billion years ago, big historians chart first the evolution of matter and energy and then the evolution of life itself. Human beings appear remarkably late in this long journey of the universe but at this moment in history are having remarkable effects not only on each other and other species but also on entire ecosystems and in fact the geology of the planet itself. In recognition of this impact, the International Union of Geological Sciences is considering whether we are entering another geological epoch that some have suggested calling the Anthropocene to mark the impact

of our species on planetary strata.

Although not officially labeled as the Anthropocene, arguments about when such human impact started are raging and include some who believe that our major impact started when we developed agriculture. Others believe that it was the Industrial Revolution or the emergence of nuclear energy. Yet others have proposed an alternative term, the Capitalocene recognizing that the impact on the planet is not equally distributed among individuals or national groups. Market fundamentalism and a focus on individual rather than collective responsibility marks the economic and political forces labeled neoliberalism [2]. Growing economic and social disparities in essentially all countries are largely the result of many wealthy people exploiting the planet for their own personal gain and leaving a legacy of ecological devastation for future generations to address. Our overemphasis on financial measurements of success has led to the suppression of concern about other values that might actually be more life preserving. We need to reinvent concepts such as health and wealth. Health is more than the absence of the disease and should be based on more than purely medical models. Rather health should be viewed as ecopsychosocial in which environmental and social determinants of health should receive more attention than the current overemphasis on molecular reductionism and genetics. Individuals and communities can perceive themselves as wealthy based not purely on monetary measures but rather on quality of life. A commitment to values such as responsibilities for others now and in the future should be viewed as essential to broader ideas of health and wealth.

Trees and forests fit into this big history picture because their phylogenetic histories go back millions of years long before mammals and primates. Moreover it is their death and decay thousands of years ago that led to the deposition of fossil fuels, such as oil and coal, that we exploit today. This legacy of dead trees could be a blessing to provide energy when we really needed it. But rather than take advantage of solar and water power, we are essentially spending our children's legacy by burning fossil fuels in excess. Moreover, trees play important roles in water cycles, and it is water that is increasingly becoming a rate-limiting step in human flourishing [7]. We are running out of clean water to drink and for other needs. These are the deep time cycles of natural and geological time that are built into the biological and cultural DNA of trees. This is why to take the long-term view of human and planetary health we need to listen to and learn from trees.

4.3 Conclusion

This paper literally and figuratively represents a transdisciplinary collaboration with trees, as sources of biological and cultural wisdom. If human civilization is to survive (and it cannot in its current forms with the increasing ecological devastation), we need new understanding of systems biology, information processing, and cultural metaphors. We need new hopeful stories that promote conceptions of health and wealth that are more than just absence of disease and presence of money. Learning has been key to the success of our species so far and offers promise for making the cultural transformation we need. Intergenerative and intergenerational learning allows us to explore conceptions of time and space that will not only include human history but conceptions of the cosmos more generally. Transdisciplinarity represents a growing area of human intellectual and ethical endeavor that will contribute to the

development of thoughts, ideas, values, and processes that will help promote human survival and (hopefully) flourishing.

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CHAPTER 5

Being Transdisciplinary in Human Sciences: The usefulness of Integrative Medicine in contemporary society

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In conventional medicine (Western medicine) the methods of healing are carried out externally through allopathic medicines (with several side effects), surgery and radiation (in the case of cancer) until the disease disappears - the biological dimension of the human being. However, Ayurveda (Eastern medicine) and mind-body medicine argues that the cause of some diseases, such as those in the psychiatric area (for example, a depression), is due to an imbalance between the mind (our thoughts, feelings) and the body, and so healing should also be done by the mind itself (through meditation, psychotherapy, etc.) in order to change the pattern of behavior that led to the disease (which is not relevant in Western and conventional medicine) – the psychological dimension of the human being. This “communication” is about the theme of conventional medicine (curative medicine) versus Ayurveda (preventive medicine) and mind-body medicine in order to describe the usefulness of integrative and transdisciplinary medicine – the bio-psycho-spiritual dimensions of the human being - that might contribute to goal #3 (“To ensure healthy lives and promoting well-being for all, at all ages”) of the Sustainable Development Goals (SDG) of the United Nations 2030 Agenda.

Keywords: conventional medicine, Ayurveda (mind-body medicine), integrative medicine, goal #3 of the Sustainable Development Goals (SDG) of the UN 2030 Agenda.

5.1 Introduction

One purpose of Integrative medicine [1] is to contribute to the connection of Eastern medicine (particularly Indian traditional medicine or Ayurveda) with Western medicine (conventional medicine) in order to develop a system of health care that

might cure the entire person (bio-psycho-spiritual dimensions). Then, one application of Integrative medicine is to support goal #3 ('To ensure healthy lives and promoting well-being for all, at all ages') of the Sustainable Development Goals (SDG) of the United Nations 2030 Agenda [2].

In this regard, I'm going to describe the historical roots of Eastern medicine and Ayurveda (preventive medicine) and the historical roots of Western and conventional medicine (curative medicine). There are three main historical roots for Ayurveda [3], namely, the History of Atharva-Veda, the Samkhya philosophy, the textbooks designated by Charaka Samhita and Sushruta Samhita. There are four main historical roots for conventional medicine [4], namely, the history of Hippocrates and Galen medicine, the contributions of Arabic medicine, the Cartesian dualism and mechanism between mind and body, as well as some experiments performed in the brain area.

5.2 The Historical Roots of Ayurveda: An Overview

The Atharva-Veda is the last of the four Vedas (the Indian Holy Books) and is described over 20 books and some of them (called by "Samhitas") give a detailed description of the health sciences (human body anatomy, diseases, causes and the cure through medicinal plants) [5], [6]. The Ayurveda is a preventive medicine who cares for the patient as a whole and so, it states that health of a human being reflects the harmony of his/her lifestyle (the quality of sleep, food, thoughts and feelings) [7]. In this regard, the Samkhya philosophy (one of the six schools of Indian philosophy) applied to Ayurveda argues that is the "Ego/personality" that creates the unbalance/disharmony in the lifestyle of the human being [8]. Then, the analysis of mind-body relationship is made in Ayurveda through the "doshas" (vata, pitta, kapha) and "sub-doshas" [9]. The Ayurveda (from the Sanskrit, *Ayur* (means Life) and *Veda* (means Science)) which is described in the Hindu texts designated by Caraka Samhita (internal medicine treatise) and Sushruta Samhita (surgery treatise) [10], is a kind of mind-body medicine because the conscious mind plays a fundamental role in the process of self-healing (which is not relevant in conventional medicine) [11]. In Ayurveda, the process of healing is performed in different dimensions of the human nature as defended by the Panchakoshas theory [12].

There are *some theories which support Ayurveda* and the mind-body medicine, such as Holographic Mind theory (proposed by Karl Pribram and David Bohm) [13] and the Mind-Brain theory (proposed by Stuart Hameroff and Roger Penrose) [14]. The Holographic Mind theory claims that the mind (our thoughts, feelings) is a hologram, and the space-time reality is a "projection" made by the brain of this hologram (mental, emotional, vital patterns of behavior). In this regard, Amit Goswami [15] defends that the holographic mind might be described as "quantum waves of possibility".

The observation (or the choice) made by the subject (called by "wave function collapse") lead to the manifestation of holographic mind, namely, the disease or health. This means that disease and health are together inside us, that is, there is a unification of the subject (patient) and the object (disease or health) through the action of the Hidden Third (proposed by Basarab Nicolescu) [16]. The Mind-Brain theory also states that the "quantum component of the mind" (located in tubulins) is

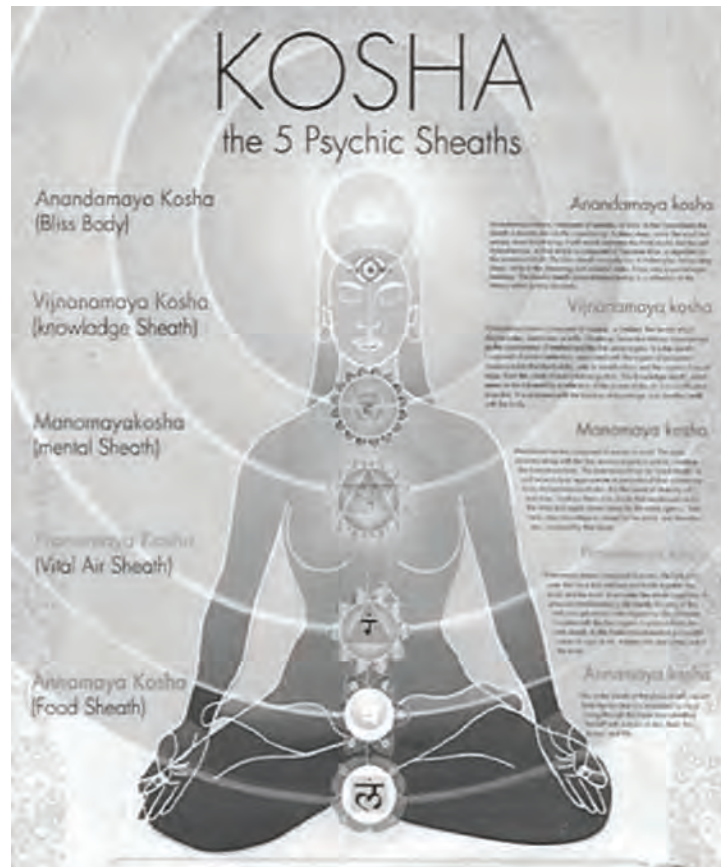


Figure 5.1: The plans of consciousness in the human being (Photo Source: Courtesy of Aaron Staengl).

responsible for the change of the pattern of behavior that causes the disease, while the “classical component of the mind” (located in dendritic membranes) is responsible for the maintenance of health.

An example of the application of these theories which support Ayurveda might be seen in the different attitude of two people who need to deal with a problem (divorce, unemployment, death of a friend) [17]. One of them addresses this problem with positive thoughts and feelings (through meditation, psychotherapy) and so he/she might overcome the hard situation more strengthened by the experience. On the contrary, the other person has only negative thoughts, feelings and so he/she might have a depression. In summary, these two persons have different approaches to the same problem which leads to different health conditions for the two patients.

Ayurveda also defends that the process of healing is performed in the five dimensions of the human nature, as described by Panchakoshas theory. This description could be seen in Figure 5.1 [18]. These five plans of consciousness in human beings

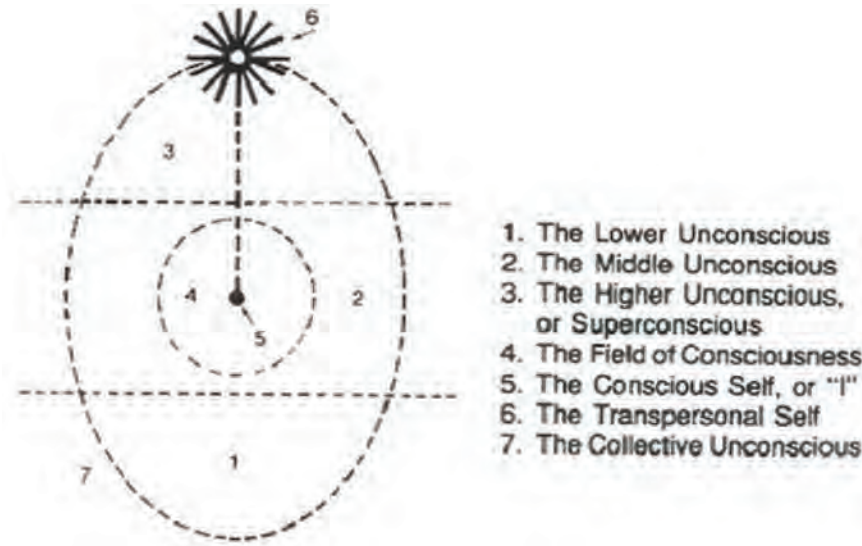


Figure 5.2: The areas of consciousness in the human mind (Photo Source: Courtesy of Kenneth Sørensen).

are: Annamaya Kosha (physical body), Pranamaya Kosha (vital or pranic body), Manamaya kosha (mind or thoughts/feelings), Vijnanamaya Kosha (intuitive knowledge), Anandamaya kosha (bliss or conscious linkage with the soul), Atman (soul). These several levels of consciousness might be related with the “several levels of reality and complexity” proposed by Basarab Nicolescu [19]. Moreover, from the top to the bottom, we could see the seven main chakras (from the Sanskrit “wheel”), namely, Sahasrara (top of head), Ajna (inner vision), Vishuddha (throat), Anahata (heart) – the upper chakras- Manipura (solar plexus), Svadhistana (sexual), Muladhara (basic) – the lower chakras. The chakras operate according to the field of consciousness or perception of the observer/subject. If the field of consciousness is smaller, then the perception of reality is more limited and the subject has less possibilities of choice in his/her life. In this case, only the lower chakras are active. On the contrary, if the field of consciousness is greater, then the perception of reality is broaden and the subject has more possibilities of choice in his/her life. In this case, the upper chakras are also active [20]. We could make a comparison between the Figure 5.1, defended by Eastern thought, and the Figure 5.2 [21], defended by Western thought. In Figure 5.2, described by Roberto Assagioli as *Egg’s diagram* [22], we could see the several areas of consciousness in the human mind. In psychology, consciousness with perception means self-awareness, while consciousness without perception means unconscious. In this regard, we could see the unconscious side of the human being (numbers 1,2,3 and 7), the field of consciousness (or the consciousness mind) of the human being (number 4) where appear the mental and emotional patterns of behavior (Jung called them Archetypes [23]), the “ego/personal I” (number 5) that might establish a conscious link with the soul (number 6).

5.3 The Historical Roots of Conventional Medicine: An Overview

Western and conventional medicine has its roots in Hippocratic medicine which sees the man as an organized unit constituted by four fluids, being the illness a reflection of an imbalance among these humors. Galen complemented these concepts through the use of medicinal herbs. Moreover, the Arabic medicine was responsible for the emergence of the concept of hospital, the compilation of various medicines and the development of surgical practices. Andreas Vesalius deepened the knowledge of the human body. These ideas remained unchanged until the end of the 16th century [24].

In the 17th century, Descartes proposed the separation of mind (“res cogitans”) and the body (“res extensa”) - Dualism. The mind is the subject of activity of religion and philosophy, while the body is the subject of activity of science and medicine. The body should be treated as a machine. The illness is a disturbance of the components of the human machine - Mechanicism. This is the *paradigm of Western and conventional medicine* [25]. The root of Cartesian dualism is described in “Discours de La Méthode” (being this idea expressed through the famous sentence “I think, therefore I am” or “cogito, sum”), while the root of Cartesian mechanicism is described in “L’Homme” (Descartes proposed to apply the principle of a mechanical interpretation of the physical world to living things) [26].

However, in the 18th, 19th and 20th centuries, it occurred some experiments in the brain area by Galvani (who demonstrated the bioelectricity), Golgi (who identified the dendrites (extensions of neurons)), Ramón y Cajal (who proposed the theory of individual neurons), Bois-Reymond and Muller and von Helmholtz (who defended that the neuron could influence others neurons through signals electro-chemicals), Jackson and Broca and Wernicke (who demonstrated that sensory and motor functions could be assigned to certain areas of the brain), Hubel and Wiesel (who contributed to the “mapping” of the human brain), Sperry and Gazzaniga (who demonstrated the connection of perception and “Corpus Callosum”) that has led to suggest that the mind and the body are related between them [27]. This idea is the core of the research work of António Damásio [28]. This scientist claims that Descartes’s error is related to the separation between the body and the mind, and that they could exist separately from each other. In this regard, António Damásio defends that the emotions and feelings are an important link between the thoughts and the physical body. For example, the feelings and emotions have played a key role in our decision-making and personal choices in the survival of mankind through ages, as well as in the perception and the expansion of awareness of the human being. In summary, the mind of the patient (thoughts and feelings) plays a relevant role on outer reality (which is not relevant in the Cartesian Universe). Despite in the last two centuries have been performed these experiences in the brain area, nowadays, the patients are still treated by conventional and Western medicine in a Cartesian manner, that is, the human body is treated as a machine, where the mind does not play any role in the healing process [29].

5.4 The usefulness of Integrative Medicine: An overview

In contemporary society, with the advances of science is expected that human beings will live longer in the future [30]. The question is whether this increase of expectation of life will also correspond to an increase in the quality of life to the patient (biopscho-spiritual dimensions of the human being): goal #3 (“To ensure healthy lives and promoting well-being for all, at all ages”) of the Sustainable Development Goals (SDG) of the United Nations 2030 Agenda. What remains to be done in this area of research (History of medicine) is to find a “model of Integrative and Transdisciplinary medicine” [31], [32] in order to see the patient in an holistic way: soul, mind and body [33]. In this regard, I have to mention that proper soul-mind-body alignment has a positive effect on the way the chakras operate, which has a beneficial effect on the patient’s health [34].

In historical terms, Integrative medicine emerged in the United States in the 1970s and 1980s, notably through the doctors Andrew Weil (from Center for Integrative medicine, University of Arizona) and David Eisenberg (from Harvard University), followed by Daniel Vicario (from San Diego Cancer Center, University of California) whose holistic knowledge of medicine has spread throughout the world. Nowadays, another examples of integrative medicine doctors are Paulo de Lima (from Albert Einstein Hospital, in Brazil), Matthias Girke (from Havelhöhe Hospital, in Germany), in the West, and Ram Vishwakarma (from Indian Institute of Integrative medicine, in India), Chen Keji (from Chinese Association of Integrative medicine, in China), in the East, among others [35].

An *example of the usefulness of Integrative medicine in contemporary society* might be seen in the methods of healing of a patient with a depression [36]. In conventional medicine, the physician gives allopathic drugs (with several side effects) in order to relieve the physical symptoms of depression (*the biological dimension of human being*), such as ideas of fault/failure, emotional sadness, lack of physical appetite [37]. On the other hand, in mind-body medicine and Ayurveda the physician makes the connection between the mental/emotional pattern and the physical behavior through the “doshas”, trying to promote positive thoughts and feelings in a natural way (meditation, contact with friends and family members). In fact, in Ayurveda the effective process of healing only occurs when the patient wants to change the pattern of behavior that led to the depression (mental, emotional, physical) in order to eliminate the causes of the disease (*the psychological dimension of human being*), as well as allowing to reduce the allopathic drugs (not just the cure but also give quality of life to the patient) and the costs associated with this medication which is not addressed by Western medicine [38]. Moreover, in Ayurveda and mind-body medicine, the body (is not just a machine as claims Western medicine) also plays a relevant role in the development of the consciousness mind of the human being (*the spiritual dimension of the human being*) as described by Panchakoshas theory and Egg’s diagram referred to earlier [39].

5.5 Conclusions

In summary, I should point out that there is an *experiment that supports a model of Integrative medicine*, namely, the experiment of Alain Aspect and collaborators on

the instantaneous communication between two quantum particles correlated by polarization, regardless of their distance (called “quantum nonlocality”), [40] and which Jacobo Grinberg-Zylberbaum and collaborators [41] repeated through an experiment of telepathic communication between two shamans’ brains correlated through meditation. This type of nonlocal experiments are present in the “spontaneous cures” [42], [43] (which conventional medicine can not explain), but whose cause and explanation might be justified through a model of Integrative Medicine [44].

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CHAPTER 6

Transdisciplinarity and Vagus Nerve Function

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Within the definition of evolution and Transdisciplinary Becoming the finer qualities of human awareness and perception are in question. This chapter derives from a philosophy of nature and presents the argument that Transdisciplinarity's triad model will only succeed in obtaining the three levels of Reality that Being Transdisciplinary entails if it incorporates autonomic/cognitive forces within Homo sapiens' phylogenetic organization. Since co-evolutionary principles of human-brain and autonomic nervous system functioning are a biological imperative for raising normative levels of Being, individuals, schools, and cultural institutions must instill both phylogenetic and experiential understanding of human neurobiology in their curricula. After a brief historical introduction to metaphysics and vagus nerve functioning [Fig.6.1], I will move to the contemporary perspective of Polyvagal Theory and conclude with Transdisciplinarity's intrinsic need to articulate the science (nature's way) with regard to the project of grounding education within the whole primordial sense of Transdisciplinary Being.

Keywords: Transdisciplinarity, consciousness, college curricula, humanities, integrative, vagus nerve, polyvagal theory, G.I. Gurdjieff studies, evolutionary biology, neurology.

6.1 Introduction

In his prolegomena *To Any Future Metaphysics*, Immanuel Kant (1724-1804) specified metaphysics are “not for the use of mere learners, but of future teachers, and even the latter should not expect that they will be serviceable for the systematic exposition of a ready-made science, but for the use of the discovery of the science itself” [1]. Post Renaissance, marking the transition from medieval to modern world and the revival of Greek and Roman literature, Kant reached for the crux of what principle the concept of metaphysics extracts from the cognition of experience itself. Distinguishing *the science* from scientific thinking, he identified centuries of tangled knowledge to be inadequate to fulfill the experience of existence dynamics necessary

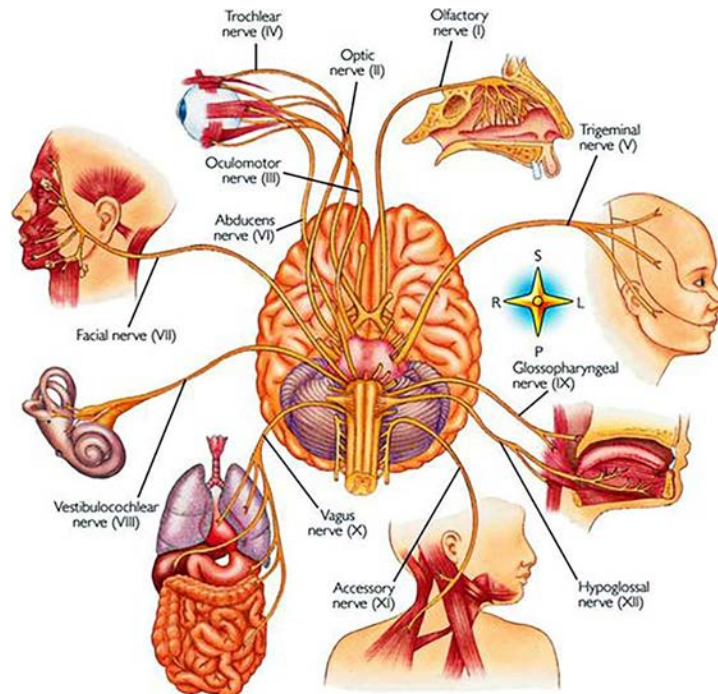


Figure 6.1: Cranial Nerves: Vagus (X).
<http://nursingtips.tumblr.com/post/58902505692/cranial-nerves>

for humans to adapt somatic agency toward their psychic potential.

Anticipating nature's process of assessment and refinement, Kant's *Critique of Judgement* [1790] later asserted: "nature is not profligate" and "process is purpose," [2] a fact that naturally transcends synthetic metaphysics. With Einstein's $E = mc^2$ and G.I.Gurdjieff's equation, extended by H.T. Lindahl (2018 [3]) : *the inverse ratio of the density-of-mass to the density-of-vibrations as regulated by the normalization of the entropy of existence by the intropy of experience* [4] , humans are signaled to the imperative for experiential observation of process and purpose in Being. How humans conserve or spend energy in relation to their phylogenetic disparate 3-brain system is a principle concept of intentional evolutionary development. It is therefore a critical principle of Transdisciplinary education, a philosophy of education that ultimately addresses nature's process.

6.2 Nature as Discourse^[5]

Today, correspondences between Gnostic and Empirical research are in plain view. The earliest touchstones of intuitive processing of knowledge go back to Pre-Socratic reasoning. The philosophers who wrote about a cosmological unified natural world and alchemical processes were, namely:

Thales	620 BCE – 546 BCE	Pythagoras	570 BCE – 495 BCE
Heraclitus	535 BCE – 475 BCE	Parmenides	510 BCE – 560 BCE
Anaxagoras	500 BCE – 428 BCE	Empedocles	490 BCE – 430 BCE
Epicurious	469 BCE – 399 BCE	Socrates	469 BCE – 399 BCE

While the qualities of intuitive examination remain preserved in Eastern sacred texts and traditions, self-knowledge in traditional Western education and culture were largely lost to the Common Era. On the empirical side, proponents of taxonomical classification have, over two centuries, assimilated an objective understanding of naturally complex adaptive systems in anatomy and physiology. What is projected from somatic sentience, through autonomic nervous system processes, is the largely inactive, latently emerging adaptive potential of our psychic organs—thought, self-awareness, intention, attention—and, with investment of practice, the finer vibration rates of impartial conscience and objective reason.

6.3 Historical Scientific Perspectives of Vagus Nerve Function

A remarkably consistent development of empirical research traces our ability to understand Vagus Nerve function. In 1504-1506, artist and scientist Leonardo da Vinci drew the “reversive nerve,” as the vagus was known in his day (Galen 1275–1326). This study was published in his anatomical, physiological, and embryological drawings of 1795 (Fig. 6.2). In his notebook, da Vinci wrote:

If the heart’s motion comes from the reversive nerves, which have their origin in the brain, then you will clarify how the soul [i.e. animal spirits] have their own origin in the left ventricle of the heart. So, you should attend well to these reversive nerves and likewise to other nerves because the motion of all the muscles arise from these nerves which with their branches are diffused through the muscles (da Vinci, [1504]; 1952 p.222).

Since da Vinci, 19th and 20th century empirical data has significantly refined our understanding of the relationship between vagus and human brain development. Four key figures brought the following findings into the 21st century:

1. Charles Darwin *Pneumogastric Nerve*
2. John Hughlings Jackson *Theory of dissolution*
3. Paul MacLean *Triune-brain neuroethology*
4. Stephen Porges *Polyvagal Theory*

In his book *The Expression of Emotions in Man and Animals* (1872), Charles Darwin proposed the central nervous system and *pneumogastric* (vagus) nerve is evolved, adaptive, and serves crucial survival and social communicative functions largely through the facial muscles. Rather than being simply a reaction to experience, Darwin postulated emotional expression is reciprocally linked to physiology. With distinct neural pathways, he observed that the vagus bi-directionally exchanges information between brain and major visceral organs such as the heart, lungs and

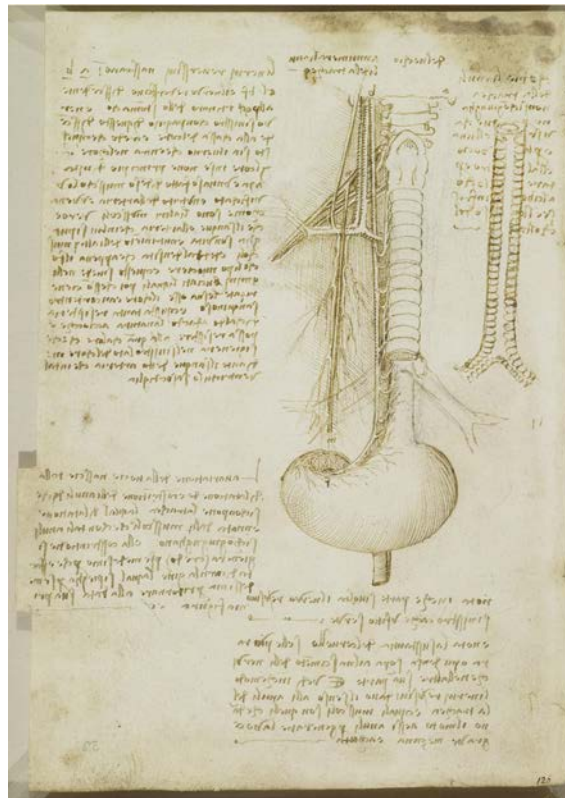


Figure 6.2: Leonardo Drawing 1504-1506
Leonardo on the Human Body: The Anatomical, Physiological, and Embryological Drawings of Leonardo da Vinci (N Y: Henry Schuman)

abdomen. He wrote, “When the heart is affected it reacts on the brain, and the state of the brain again reacts through the pneumogastric nerve on the heart; so that under any excitement there will be much mutual action and reaction between these, the two most important organs of the body” (Darwin, 1872 [6]).

Following Darwin, John Hughlings Jackson (1835-1911) developed his “theory of Dissolution.” In his 1884 Croonian Lectures, Jackson stated: “the higher nervous system arrangements inhibit (or control) the lower, and thus, when the higher are suddenly rendered functionless, the lower rise in activity.” [7] While Darwin’s theory identified mind-body connection, Jackson illustrated its dynamic relationship, whereby our inherited hierarchical three-brain structure is a disparate, unschooled, natural default system [Fig. 6.3].

In 1966, Paul D. MacLean (1913–2007) further detailed the phylogenetic development of three brains from reptiles, early mammals to man, in his book *Triune-Brain neuroethology* (MacLean, 1962) [Fig. 6.4]. From his clinical and laboratory observations at Yale Medical School, MacLean concurred with Jackson, that the human

Jackson's Theory of Dissolution

"The higher nervous system arrangements inhibit (or control) the lower, and thus, when the higher are suddenly rendered functionless, the lower rise in activity."



—John Hughlings Jackson (1835-1911)
Father of English Neurology
Quoted by Stephen Porges 11/01

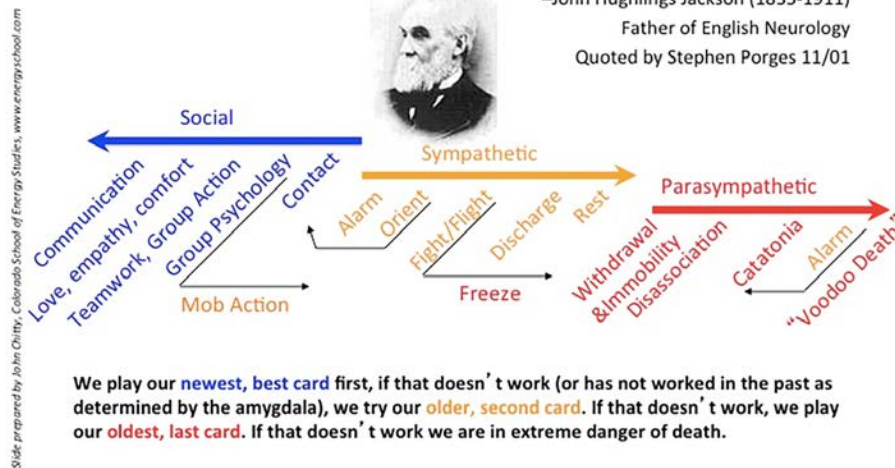


Figure 6.3: John Hughlings Jackson Theory of dissolution [1884]
Picture supplied by John Chitty, Colorado school of Energy Studies,
www.energyschool.com

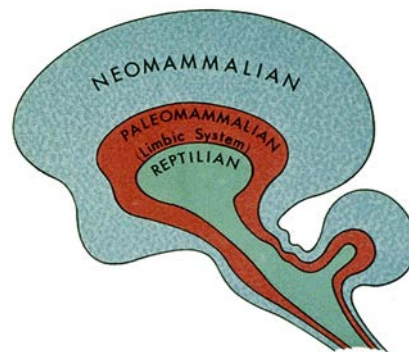


Figure 6.4: Symbolic "triune brain," expressing the evolution of the brain from reptiles, early mammals to man. After P. D. MacLean (1967, 1990)

brain is a nested hierarchy, and focused particular interest in observing how emotions effected the middle Paleomammalian limbic brain. "The appeal for an evolutionary approach to the study of the brain," he wrote, "is because it requires both reduction-istic and holistic analysis. It is now recognized that in all animals there are molecular

commonalities with respect to genetic coding, enzymatic reactions, and so on that carry over into complex cellular assemblies. Nowhere is the uniformity of complex cellular assemblies more striking than in the cerebral evolution of vertebrates, both as applies to similarities within classes and to certain commonalities across classes” (MacLean, 1988 p.126). MacLean, speaking allegorically, candidly pointed to the peculiar yet genuine human paradox when he cleverly remarked, “We might imagine that when a psychiatrist bids the patient to lie down on the couch, he is asking him to stretch out next to a horse and a crocodile.” [8].

6.4 Stephen Porges’ Polyvagal Theory

Today, three-brain dynamics are ever more experientially verifiable given empirical data Stephen Porges (1945–) provides in *The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication and Self-regulation* (1994). While Porges confirms unique traits of the vagus, he specifies the degree to which humans must learn to adapt, in order to reach latent neocortical capacity. What is not self-evident to humans is their inherent, functionally distinct brain structures and branches of the vagus nerve. It is from this evidence that I argue for Transdisciplinary educators to make provisions for conveying *the science* of that which challenges intentional neocortical development without education.

A “wandering nerve,” the vagus is a conduit motor pathway that extends from the brain stem to the abdomen’s digestive system [Figs. 6.5 & 6.6]. A division of the parasympathetic Autonomic Nervous System, the vagus regulates our digestive, reproductive, endocrine, cardiovascular and neurological systems via three primary circuits: *dorsal vagal* complex (DVC) sympathetic nervous system (SNS) and the *ventral vagal* complex (VVC). The parasympathetic vagus also provides the ability for the body to repair itself during sleep [Fig 6.7].

Overall, Porges’ model imparts a more complete understanding of how our bodies make decisions, given natural phylogenetic “stress” pressures on Autonomic Nervous System circuitry. As he refined Jackson and MacLean’s principle findings that (1) humans carry a more recently evolved (higher) myelinated sensory apparatus and (2) the ANS functions in a predictable, hierarchal dynamic, he brings exercises for assisting connectivity to our higher (newer) neocortex circuitry, some of which are found in sacred traditions.

If our ability to inhibit earlier (lower-sub diaphragm) circuits of defense and immobilization depends on recruiting our more recently evolved neocortex, we as a species can recognize what’s at stake. While reptilian and mammalian circuits are related to associative patterns of emotion—i.e. limited to a reflexive dynamic between voluntary and involuntary actions—the new third neo-cortex represents a latent (hidden) potential reconciling force, which, with intentional effort, brings an inner transformation of Being [Fig 6.8].

6.5 Implications

As humans discover higher levels of attention and intention for evolving somatic to psychic organs they come directly in touch with Transdisciplinary becoming processes. Because Porges’ empirical understanding outdates the agonistic bi-directional

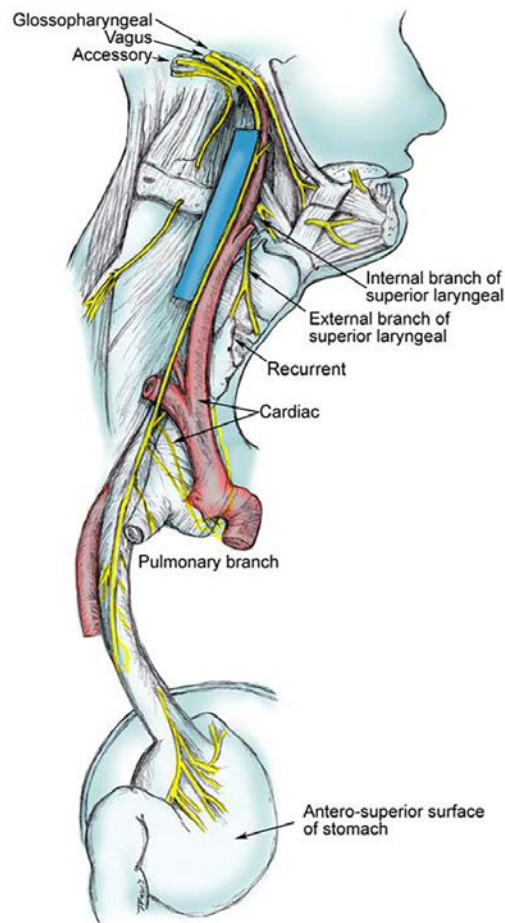


Figure 6.5: Vagus: Brain to Abdomen (yellow line)
<https://emedicine.medscape.com/article/1875813-overview>.

“fight-flight” defense model previously taught in medical schools, without ambiguity, Polyvagal Theory deserves considerable thought within the Transdisciplinarity Congress as to its implications in relation to the challenges and advancement of humans reaching the unrealized capacity of their neocortical potential.

For the vagus nerve to function fully, it relies on vagal tone or the tonic influence of the myelinated ventral pathways of the heart to regulate the parasympathetic nervous system associated with rest, relaxation, and digestion (Porges, 1994, 2017). The identification of a third circuit, the Ventral Vagal Complex (VVC) offers a primordial understanding of the natural complexity of Post-Simian Pre-Homo Sapiens striving [9]. A signaling system for motion, emotion and communication, the parasympathetic vagus nurtures our potential cortical development—a potential humans may

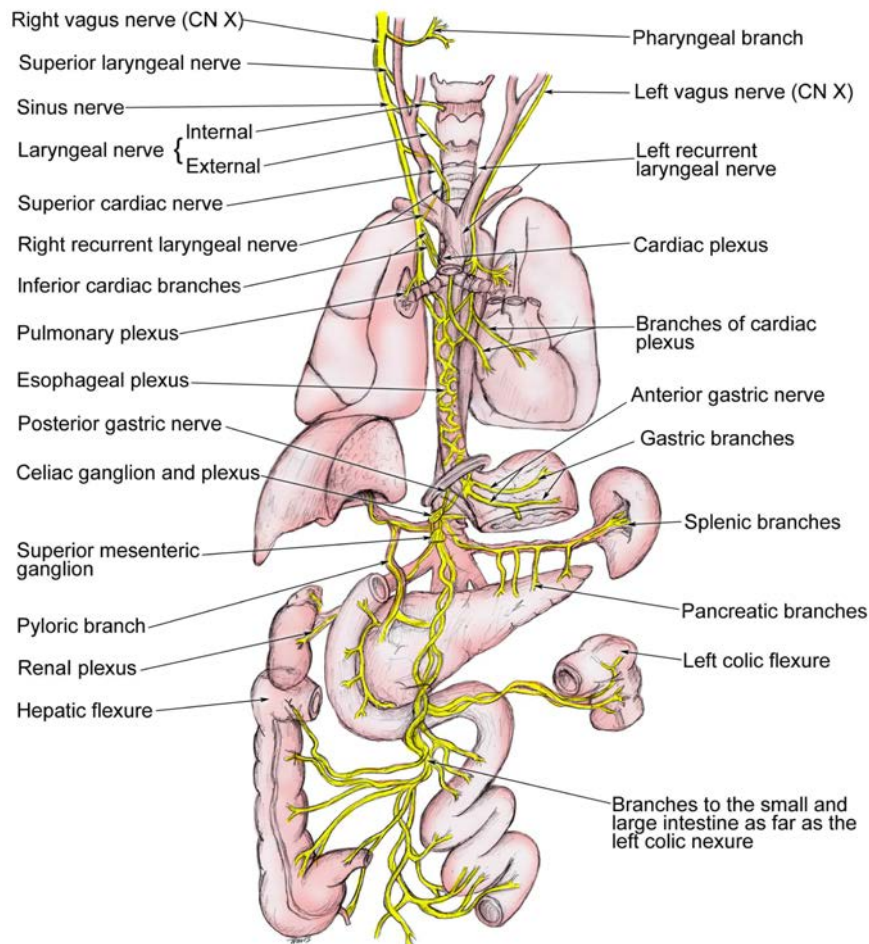


Figure 6.6: Vagus Nerve (yellow line) <https://emedicine.medscape.com/article/1875813-overview>.

intentionally work toward developing. When possible to access and integrate the whole ANS range, the built-in default system of our older (lower) two-way system is held in check.

6.6 A 21st Century Call for Synthesis of Gnostic and Empirical Research

The enunciation for an integrated Gnostic and Empirical approach still had its pre-dominating foot in metaphysics when Kant, Hegel (1770-1831), Schopenhauer (1778-1860), Nietzsche (1844-1900), William James (1842-1910) and Husserl (1859-1938)

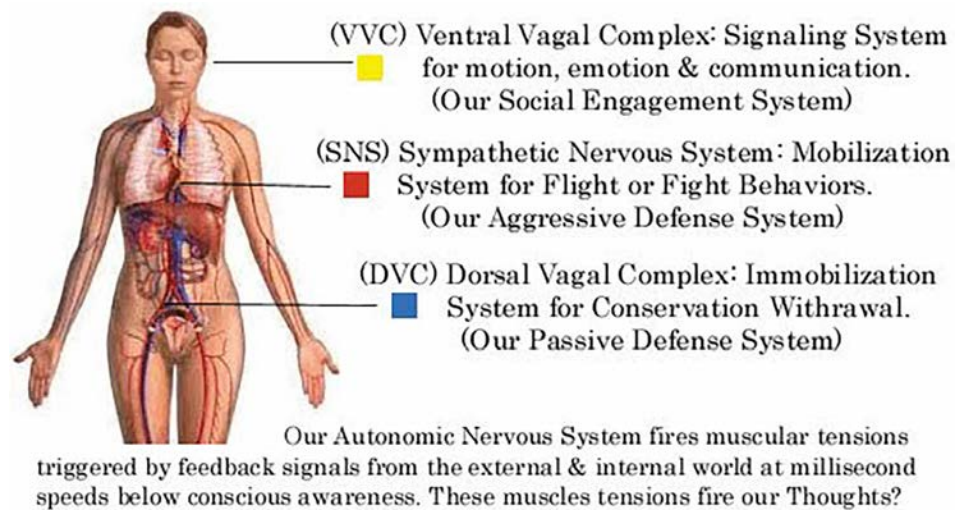


Figure 6.7: Stephen Porges Polyvagal Theory (1994)
<https://attachmentdisorderhealing.com/porges-polyvagal/>

theorized its imminence. Perhaps Goethe's (1749 -1832) last letter, written on his deathbed in Weimar, 17th of March 1832, calls attention to the Zeitgeist and inevitable future alignment. His letter, a reply to Wilhelm von Humboldt, expresses what "awareness of mind" he had experienced, unlike any previous time in his creative life, when writing part II of Faust. The following passage implicitly lays forth his phenomenological experience:

The Ancients said that the animals are taught through their organs; let me add to this, so are men, but they have the advantage of teaching their organs in return.

Every action, and so any talent, needs some inborn faculty, which acts naturally, and unconsciously carries with it the necessary aptitude, and which, therefore, continues to act in such a way that though its law is implicit in it, its course in the end may be aimless and purposeless. The earlier man becomes aware that there exists some craft, some art that can help him towards a controlled heightening of his natural abilities, the happier he is; whatever he may receive from without does not harm his innate individuality (Goethe, 1957 [1832] p.537), [10].

6.7 G. I. Gurdjieff: Somatic Evolution to Psychic Psyvolution ^[11]

A "true to life," transdisciplinary education would teach isomorphic qualities intrinsic to perception, pattern mapping, language, and aesthetic (non-directive) skills. Curricula utilizing these somatic educational tools can result in indispensable, creative learning environments. For this pragmatism to make its way beyond a natural

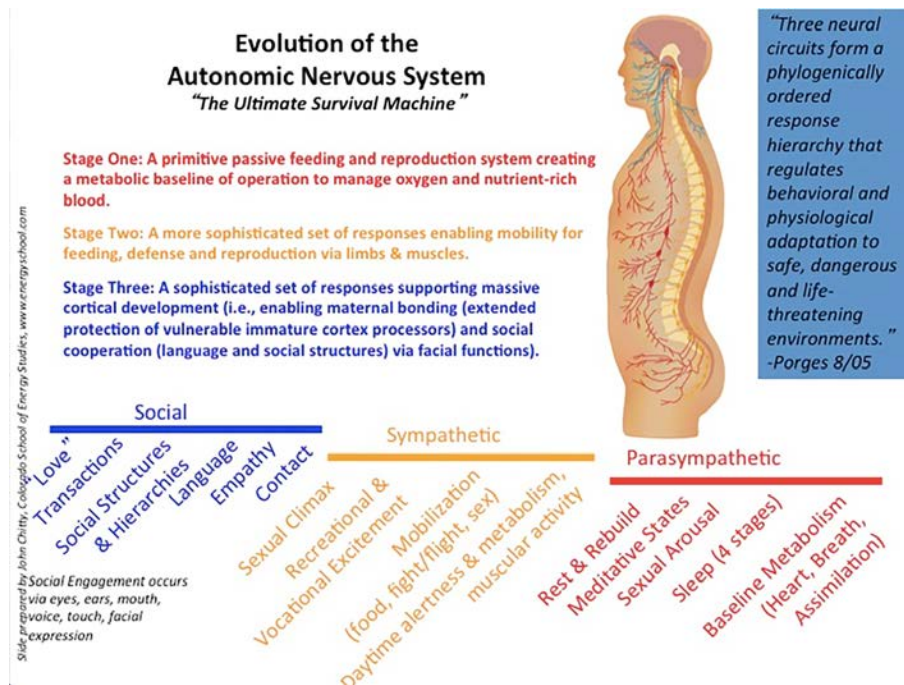


Figure 6.8: Stephen Porges Polyvagal Theory of Emotions (1994)
Picture supplied by John Chitty, Colorado school of Energy Studies, www.energyschool.com

skepticism, humans and institutions must critically engage what innately polarizes integration. That is, the inherent driven conflict that naturally emerges in human neuroception activity is the nexus where ecological aesthetic responses have the specific potential to adopt all three levels of Transdisciplinarity's theoretical model.

To adopt verifiable practices is an imperative for humans to trans perfunctory "being". G. I. Gurdjieff's (1866-1949) not widely known transdisciplinary based methods initiates three brained or three centered Intellectual, Moving, Emotional work on one's self. The pragmatic aim of his experiential methods was to assist humans in self-observation of their formative inheritance as they work to intentionally evolve their psychic, human potential.

Gurdjieff's magnum opus *Beelzebub's Tales to His Grandson*, published a year after his death in 1950, was separately recorded in dialogues that P.D. Ouspensky published in *In Search of the Miraculous: Fragments of an Unknown Teaching*, (1949). Where Goethe, Kant, Husserl and Heidegger, et al., were philosophically (mentally) aware, Gurdjieff blended sacred Eastern intuitions with Western empirical science, through a cogent practice of methods, which physically and emotionally carry the potential to unify the three brains of the human autonomic nervous system. These practices continue to be taught in small groups around the world, with headquarters located in Paris, London, and New York.

6.8 Conclusion

Polyvagal Theory and ANS regulatory functions are too strongly aligned with human evolutionary development to ignore in relation to raising higher normative levels of education. A Transdisciplinary education practice toward Being invites individuals to research, “in situ”, illusionary brackets within the body/mind’s natural environment. If principles of evolution were taught with intentional participation, the perceptual shift necessary to evolve Transdisciplinary Being would, in time, emerge.

Since the parasympathetic vagus is the primary conduit for sensory neo-cortical adaption processes, it necessarily becomes a core focus within Transdisciplinarity Being curricula. To emphasize study of the biological dynamic that naturally regulates our Autonomic Nervous System in a predictable way would establish *the science* for all future experiential learning practices of Being Transdisciplinary. Today, by changing nothing but our opinions, a cultural engagement with the much sought-after goals of metaphysics would mean adapting neural perceptions whereby the process of the release of information conserved in phenomena is expressed through the transdisciplinary instincts of science, art and religion (Lindahl, 2018). Because a trajectory for emphasis on cross-cultural research in human-brain and autonomic nervous system dynamics has not yet been explored in other literature on Transdisciplinarity, the following objectives provide focus toward formatting Transdisciplinary curricula:

Co-evolutionary, Transdisciplinary Being practices require humans to evolve self-knowledge in relation to a cosmological worldview. This micro/macro worldview offers scale and context for refining ecological aesthetic perception.

Creating transcendental coherence, where individuals re-cognize how humanity as a whole relates to larger living systems, is a gradual, natural turning point based on individual and community intentions.

By refining our perceptions, humans are directed toward parsing distinctions between objective and subjective associative psychology.

The Vagus Nerve is the biological instrument that regulates higher normative levels of perception, response, and communication in a predictable phylogenetic manner. An experiential Gurdjieffian holistic gestalt offers specific practices conducted in life itself.

The transition from the predominance of our somatic survival instincts through the assisted refinement of our psychic organs of thought, self-awareness, intention, attention, evolves the higher normative levels of objective reason, requisite for becoming a Transdisciplinary Being.

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4. Intropy = Experience. The digestive refinement processes of food, air, impressions, and psychic education. Entropy = Loss of vibration rate due to the weight and complexity of existence.
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11. Psyvolution is a neologism coined by the Intropy=Entropy Institute expressing the process in which, what will emerge can be sensed from what has emerged. The passage is paraphrased from the Institute's mission statement whose aim is to develop a College of Humanology, where by the study of essence and being are experientially discerned. Susannah Hays is co-founder of the Institute, working with founder, Harold Terry Lindahl.

About the Author



Dr. Susannah Hays is an American artist and educator practicing in the fields of philosophy, ecology, book arts, analogue and digital photography. Her fine art work has been widely exhibited and collected by numerous private and public institutions, including Stanford University's Green Library who acquired her archive in 2010. Presently administrating the Intropy=Entropy Institute's transdisciplinary projects to the general public, she joined the faculty at the San Francisco Art Institute between 2000 and 2012, and has since been contributing faculty at the University of Georgia's program in Cortona, Italy and Leuphana Universität in Lüneburg, Germany. She is represented by Photo-Eye Gallery and Photo-Eye Books + Project Space in Santa Fe, New Mexico, where she maintains her home and studio.

CHAPTER 7

Transdisciplinarity and Environmental Education: Comprehensions about Silence and Being in Vedanta

Samuel Lopes Pinheiro and Humberto Calloni, ¹ Doctorate student at Environment Education Program at Federal University of Rio Grande, Brazil, member of GEC (Complexity research group); ² Phd in Education and Full Professor at Federal University of Rio Grande, Brazil, leader of GEC (Complexity research group)

This present work aims to briefly present a transdisciplinary thesis done in a Post-Graduation Program in Environmental Education in Brazil in the level of Master's degree. The focus was the concept of "Silence" and "Being" in Vedanta (an Indian philosophy) perspective to elaborate about the foundations of Environmental Education. The study begins by reflecting on Western ways of being and the evidence of a Western paradigm that signals innumerable crises. Further, concepts of Vedanta are presented and then the reflection passes through a hermeneutic of silence, assuming practices of silence and meditation as a search for a sense of being that strengthens aspects such as Learning to Be and Learning to Live. From the interaction of knowledge between East and West, it is announced an Integral Environmental Education as necessary in the socio-environmental thinking and action, which corresponds in a non-dualistic way of integrating aspects of life.

Keywords: Transdisciplinarity; environmental education; silence; being; vedanta.

7.1 Introduction

This text is a small part of a broader study, a transdisciplinary thesis done in Master's degree in Environmental Education. The entire text of the thesis has 179 pages distributed in 3 chapters: i) Reflections East-West West-East; ii) A hermeneutic of silence; iii) For an integral Environmental Education. The main objective of that study was to understand a path of interaction of knowledge between West and East through the comprehension of Being and Silence of Vedanta Philosophy. From this movement, interrelate with the debate of the field of Environmental Education and

its foundations with the questioning about human and nature.

Here it follows some chosen parts of each chapter in order to provoke the feeling of the whole work. This study is a try of encounter between Eastern and Western philosophies to make a transdisciplinary movement of the knowledge in the sense to create space to an integral perspective for Environmental Education. The concepts of Silence and Being according to Vedanta philosophy together with an understanding about the crises that goes with the Western paradigm, then a hermeneutic of Silence passing through the understanding of the silence of meditation and in the end some topics to be worked out in terms of Environmental Education.

Methodologically this encounter between East and West occurs through complex thinking and a transdisciplinary approach. However, to sketch an image of this methodological process, we creatively place two deities in rapprochement, one deity of the ancient Greeks, the Hermes, and the other, the Shiva, of the Indians. The French philosopher and mathematician Michel Serres (1930 -) uses the image of the god Hermes of Greek mythology as an allegory to explain this movement of knowledge construction. Because of the various attributes of this Greek deity, such as being a messenger and related to hermeneutics. Hence the hermeneutic name itself, comes from the name hermes.

If, in Western terms, the metaphor of the god Hermes is used to signal hermeneutics and approximations of distant linear times; in Eastern terms, the metaphor of the god Shiva appears to represent the movement and the dance of transformation. It is par excellence the divinity of the yogins and is often represented as a yogin, with compressed and tangled hair. The myth creates a contiguous sense to the established meaning, revealing the creative force responsible for the unconscious change of history. One should not ask what myths mean, because myths do not mean, they operate. When, from a distance, we perceive meanings, the myths have already distanced themselves and their place has been occupied by codes that sometimes organize our way of living and speaking [2].

The myth then appears as a sense operator. The hyper-rationalization of the Western technical world has left us orphans of the imaginary aspects of being. Myth, being replaced by reason, leaves a void in the creative dimensions of the human. Then we can take up the myth, not in its archaic sense, but now renewed by reason itself, knowing how to articulate it as an operator of meaning.

Shiva is the god belonging to the Hindu trinity, composed of Brahma-Vishnu-Shiva. Shiva is the third, the number three in this relationship. While Brahma is the creation, the number one; Vishnu is the maintenance aspect, the number two; Shiva is the aspect of destruction-transformation, the number three. In addition to the character of the myth, of the forms these deities represent and are represented, some Eastern conceptions, such as the Vedanta Philosophy, regard the Hindu trinity as a philosophical explanation for the phenomenal material world itself. The world and all the beings experiment this mentioned trinity. In general, here in this work, Hermes in a metaphorical way helps us to think about the hermeneutics of silence, its different attributions and conceptions throughout historical linear time, and Shiva, helps us to make and image the transdisciplinary and transformational movement in the field of Environmental Education fundamentals.

7.2 Reflections about Utopia and Transdisciplinarity in the Context of Environmental Education

In this scenario of life crisis that we observe in the contemporaneity, Environmental Education stands out as a concrete utopia under construction. That is because Environmental Education is situated at a nodal point of articulation about what to do as humanity, whether in the individual or collective sphere, and due to it is connected to the dimension of the environment. This characteristic can be thought as a regenerative aspect of Environmental Education, considered utopian. The term "utopia" in our "hypermodern times", as posed by the French thinker Gilles Lipovetsky (1944 -) is fragile [3]. Other authors also point out the lack of values, or the growing of uncertainty of historical movements, such as the Polish Zygmunt Bauman (1925 - 2017) and the Portuguese Boaventura de Souza Santos (1940 -). Utopia is also discredited as a scientific value or path that must be imbricated, because the collective utopias of the twentieth century ended up collapsing in ethical terms when its effectiveness in practice.

From this characteristic of Environmental Education, we could think with Bauman that posits that today we do not have utopias nor dystopias guiding collective ends to the good society: "Everything, so to speak, runs on behalf of the individual". Zygmunt Bauman points out that, in contemporary times, utopias (a better world) should be thought through critical reflection on existing practices and beliefs to make explicit that "one thing is missing" [5]. But what is really missing? Or is it always necessary to have a certain sense of existential emptiness to propel us towards new horizons?

Here we have a possible reflection or elucidation about this feeling that something is missing, precisely in the lack of sense of Being. For there is a crisis of meaning, where individuals live without a transforming utopian horizon, nor of themselves, much less of the human and ecosystemic relationships. So, it is necessary to revisit the category of utopia, while still present in our socio-environmental actions. With it, utopia, to push what Boaventura de Souza Santos, already in the 1980s, called the "emergent paradigm". Because, according to this author, the dominant paradigm shows signs of collapse and we are at a threshold moment where we perceive signs of the new. At this point, one realizes the need to construct a science that accounts for the complex relations of the humanities with each other and with the environment. SOUZA SANTOS (2000) speaks not of a utopia properly, but of a "heterotopia" [6]. Instead of the invention of a place situated somewhere or elsewhere, the author proposes "a radical displacement within the same place: ours" [7]. But how can we characterize this common place, called "ours", if we are more and more individualized and under artificial protections?

For Gilles Lipovetsky there was the consecration of the present in the relationship of man with time and the death of collective utopias. But, at the same time, there is the "intensification of pragmatic attitudes and scientific forecasting and prevention" [8]. This opens up an expansion of the sense of present time because there is a constancy of thought in the future. As the temporal relation of the present is extended, people complain of a lack of time. Instead of the collective sacrifices that were made in the past in the name of a common political cause, we now sacrifice the individualized time of the present with the fear of the future even more uncertain.

While utopia remains on the horizon as a motivational factor for the human being, it seems that it works in the sense of giving fuel to the walker. But when utopia becomes achievable, we tend (as humanity) to a dystopia, or to the antithesis of utopia. At least, these are the impressions left by the collective experiences of the recent past. Nevertheless, from this sense of discrediting utopia, I believe that the utopian senses of the human being are to be recovered because While utopia remains on the horizon as a motivational factor of the human being, it seems that it works in the sense of giving fuel to the walker. But when utopia becomes achievable, we tend (as humanity) to a dystopia, or to the antithesis of utopia. Or, at least, these are the impressions left by the collective experiences of the recent past. Nevertheless, from this sense of discrediting utopia, I believe that the utopian senses of the human being are to be recovered because we are devoid of horizons and dreams in an empty sense of the present, preferentially inflamed by the astute consumerism of globalized society, which is inserted in human dreams through many ways.

Thus, Environmental Education is understood here as a conducive field to pedagogies that chase the drives of life, in the encounter with the other and in the regeneration of the senses of being. It recognizes the current civilizational crisis and throws itself in the adventure of building new senses of being against the hopelessness and fatalism of an abyss as the inevitable destiny of humanity. At the same time, it does not self-deceive itself with a naive optimism that will save everything in the end, but which seeks to understand the present and the material reality, opening up to the different dimensions of the human spirit, recognizing its limitations and uncertainties. This work takes part of a perspective that understands that the dialogue of knowledge, cultures and worldviews are pertinent for the maintenance of the diversity of life and for the knowledge of the Other and of Oneself. In this process, tries to contribute to the revitalization of the relation nature-humanity and for a planetary ethic.

In this sense, transdisciplinarity guides us that knowledge is a construction that is done among people, within the framework of a society that is not closed [9]. It is also done in nature, the original environment of the world, where the horizons and the borders of action are given. It is understood, therefore, the knowledge as being in interminable construction. Thus, knowledge only makes sense and can only be understood in its updating. This is done through the joints, in the intersections of interest and in the overcoming of the epistemological frontiers that have been broadly delineated in the last 300 years of the history of science. Transdisciplinarity, as the *trans* prefix indicates, concerns what is at the same time between disciplines, across different disciplines and beyond any discipline. Its objective is the understanding of the present world, for which one of the imperatives is the unity of knowledge [10].

In this way it is possible to update knowledge through the dialogue of knowledges. To go beyond the epistemological frontiers of conventional disciplinary knowledge, putting the Eastern and Western knowledge into dialogue. For this is one of the great separations still lingering in knowledge, which may reflect innumerable other separations embedded in human thought and action itself.

For the Indian philosopher Jiddu Krishnamurti (1895 - 1986), the crisis we often address is an "internal crisis" and we are not willing to resolve this [11]. In Western education there is no interest in engaging in the perception of oneself as it can be found in the interest Eastern knowledge. The author argues that modern education is transforming us into entities without understanding and our actual education does very little to help us discover our individual vocation [12].

In turn, one of the incongruities of education may lie in the established relationship between *doing* and *suffering* [13]. This is because this doing (the inward look, or the action of self-reflexive silence) is impregnated with suffering, which makes it difficult to meet pleasure and learning, and learning with pleasure, by using Basarab Nicolescu terminologies. The process of observing oneself internally does not correspond to a common practice of the contemporary Westerners, neither in educational practices, nor in daily life, nor in environmental perception. Hence the importance of the discussion about silence because it signals to this need of internally observation. The interaction between the inner being and the external being would thus correspond to improvements in levels of perception and levels of reality [14]. From the multiple contacts between levels of perception, new possibilities arise between levels of reality, realizing transdisciplinarity in action.

The dual conception is real at a certain level of reality¹ [15]. Sometimes the predominance of dual vision seems to be accentuated, taking on the airs of separatism and fragmentation, as one claims to be the only prism of interpretation of reality. Life in its multidimensionality, coupled with this dual mode, closed to these fragmentary conditionings of human existence, is co-opted by the power games of relationships and becomes a hostage of its own condition, closing in a single level of reality, that is, the polarization of dualism. The fragmented vision becomes mediocre, because it shatters and shrinks in the face of the importance we give to the material in front of the spiritual, subject to the object (or the opposite) and human in front of nature. Stimulated by the predominant fragmentary view, we trigger a tendency toward relationships of hierarchical superiorities, when we feed, feedback, and reproduce the established dual conception.

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.²

In this sense, transdisciplinarity does not appear to be a superficial search for a planetary homogenization that closes and makes sectarianizations. On the contrary, it presumes rigor, encourages openness and tolerance as critical steps for maintaining alertness so as not to fall into the traps of fragmentation or absolute scientism, which may be unable to recognize itself in the Other and in other knowledge.

7.3 Getting to Know the Concept of Being and Silence in Vedanta

It is normally considered the following classification among the Indian philosophical schools: Nyaya, Vaisheshika, Sankhya, Yoga, Mimamsa e UttaraMimamsa (or Vedanta). These are orthodox representatives, that is, they accept the authority and relevance of Vedas' reading. Among the orthodoxes that rebound Vedas and, in a certain

¹"The different levels of reality are accessible to human knowledge thanks to the existence of different levels of perception, which are in a one-to-one correspondence with the levels of Reality. These levels of perception allow an increasingly general, unifying, encompassing view of Reality without ever completely exhausting it"[16].

²Article 5 of the Charter of Transdisciplinarity, available in The manifesto of Transdisciplinarity [17].

way, also have a connection with these writings, we find: Carvaka, Jainism and Buddhism. The fundamental main texts to the study of Vedanta tradition are: Upanisad, Bhagavad Gita and Brahma-sutra. The second of them, Bhagavad Gita is part of Vedas and is a further text, inserted inside the Indian epic text called Mahabharata. The last one is called Nyaya-prasthan, because it shows the lessons of Vedanta through a logical order [18].

In *The Tao of Physics*, the Austrian physicist Fritjof Capra affirms that Vedanta is a philosophical tradition of intellectual accurate work that embodies a variety of Indian mystical lines [19]. It is based on Upanishads³ and subsequent literary productions which continue the argumentation under the same terms of a concept of Brahman⁴, that is “not personal and free from any mythological content” [20].

A meaning of non-dualism appears in Vedanta, and it happens due to a recurring understanding that everything is connected to everything in the world of phenomena. This Brahman, generically translated as “The Absolute”, actually, on the understanding of Vedanta, does not have a close totality in itself, because it is infinite and not describable through close qualifiers, although it undertakes several qualities in its expression. It is not a whole, in a hypostatizing sense that would solve everything, but only an understanding of the interactional network established by all the beings and their consciousness since one of the Vedanta lessons is that the consciousness is Brahman. This meaning of non-duality had already been in Upanishads and Shankara reaffirms this assertive with their books and comments in the VIII A.D. Shankara strongly influenced people of its time, in which its philosophy was not claimed in India, but also abroad, as one of the most valuable works by the mankind’s geniuses, even though Shankara stood not as the creator of a thinking, but as a successor of what already was present in Upanishads.

The nature of Being in Vedanta is *Satchidananda*. Sat means knowledge, *Chid*, existence, and *Ananda*, bliss. These characteristics are the ones of Being, that is either the Whole or the Absolute. It is also the nature of Being and the integral parts of the Whole. Both parts and Whole are identical twins of a life experimentation common process. As Brahman is identical to the self in Vedanta Philosophy, the real nature of each individual self is defined as truth, knowledge and infinite [21]. As the nature of the Being is limitless existence, knowledge and bliss, it means the individual being is also like that. Thus, the being has in itself the possibility to emerge in a continuous becoming to be.

Afterwards, about the tensions between the being and non-being, a fragmented view or not, it is highlighted the importance of the oriental philosophies’ discussion, as the Vedanta Philosophy that is here presented, it may collaborate, since it advertises, as a matter of complexity, about the meaning of *uniduality*, to which Edgar Morin refers [22]. This is due to the fact that the Vedanta Philosophy argues about the fragmentations, how to deal with opposite polarities observed in the world of life, at the same time it warns of the perception of a present unit concurrent with dualities.

One of the ways to deal with dualities, according to the oriental conceptions, is the silence, or the silence that fosters meditateness since it arises, in several oriental lines of thought, as a window to the inner vision. The silence is, for these

³Ancient texts that frequently stem from comments of Vedas. They date all the way back to periods before Buddha, probably between the sixteenth and seventh centuries B.C.

⁴Sanskrit word that is translated sometimes as “The Whole”, “The Absolute”, or “The Universal Principle”.

traditions, opposite to what we normally associate with this Word, active. Silence in an active way, deliberately done as a conscious self-awareness exercise, is a work of inner feeling expansions that provoke the reflection about itself as a “self” that objectifies a notion of “self” to rethink itself.

In this approach, the meditative silence is a work of looking at itself, in a sense of self-production of itself, not anymore as one more narcissistic mechanism of competition with itself and others or effectiveness for the sake of effectiveness. Indeed, it is done in order to see the completeness of the being and have the other as an extension. The simple fact of seeking self-awareness operates an ongoing displacement of itself which makes the subject not only consider itself, but also the other. This way, they turn themselves into subjects who search for a wide horizon of perception adjusted in a new environment of relationships. The feelings of ethics and autoethics emerge at the core of the subject as a fundamental direction to arise itself in the world [23].

In the transdisciplinary thinking, silence of the being seems to stand out as an intermediation between levels of reality in *Manifesto of Transdisciplinarity* [24]. Silence as an interaction membrane between the outer human being and the inner one as well as subjectivity and objectivity. In search for contact between levels, silence allows the listening of one and the other side, between the parts and the levels of perceptions.

The environmental education, supposed to be dialogical, brings humbleness to the other's world pronunciation listening. It also offers self-awareness because it produces recognition of my other “selves”, my own ignorance, which is no longer to alienate [25]. The lack of dialogicity is not opposite to silence, but it complexifies the meaning of environmental educability. Consequently, it inserts the third included secretly, because it touches and let it be touched by subjects and objects in the relationship. Transdisciplinarity and silence coexist pretty well since they act, as emphasized by Nicolescu, “in the name of a vision of balance between human being innerness and outerness” [26].

7.4 Foundations for an Integral Environmental Education

To integrate in Environmental Education may mean the search for antagonistic and complementary pole comprehension that the complex thinking has been signaling in its methods. Furthermore, it is essential to know how to articulate the *sapiens* and *demens* aspects of the humane, East and West, material and spiritual, culture and nature as Edgar Morin mentions we are nature and culture simultaneously [27]. In the context of the fundamentals in Environmental Education, some possibilities guide us to the sense of integrativeness. Concepts such as subjectivity, time and temporality of formations, self-awareness are brought and, still, the aspect of spirituality, in a nondogmatic way, but as a transspiritual meaning. This transspiritual perspective crosses religions, not closing them but opening to what they have in common. Therefore, the concept of silence or meditative silence transits through all these other concepts previously mentioned.

The dual nature of the subject, along with the complex idea of selfishness, can suggest about the human relationship and nature in Environmental Education. Moreover, it may refer to how much the human being has focused on itself in a logic induced by the capitalist system. In this system, life is compressed by orienting com-

petitions of behaviors in diverse sectors either due to status and money or vanities and other forms of competition. Thereby, individuals are led to wreck both fraternity signs and *ecophilia* in its etymological sense, which is related to the fraternal love by the environment. In times of barbarism development, it is quite revolutionary to bet on solidarity.

Effectiveness produces racing for production, leading to competitive societies, in which creativity, affectivity, spirituality and search for human being completeness do not have any place. In this regard, we may reflect about it, with the support of Environmental Education theorists, whose notes suggest that the school is a privileged place for that, since it is soaked with creativity [28]. In addition, it is possible to reach the goal of Environmental Education as integral, aside from encouraging the insertion of values such as creativity and imagination on the human being formation as a whole, playful dimension aspects of human beings.

From that, we could infer that self-awareness and meditative silence (Vedic visions arguing in favor) are stimuli to regenerate utopian feelings on the ways of life, justifying the concern with utopia initially listed in this text. Due to this, eastern visions as Vedanta appeal to an identification with the collectiveness, betting in trust and solidarity with others. Thus the encounter East and West, stimulates the regeneration of solidary senses in human relations and interspecies.

The author Edgar Morin also uses the word “self-awareness” in the analysis of the *computo* and the ongoing spiral of cogito⁵[29]. He distinguishes the term self-awareness in his approach by affirming it does not mean knowledge of him/herself. For Morin, it means the indiscriminate cognitive dimension in the self-organization and inherent to the *computo* is knowledge of the being about oneself. According to the philosopher, “self-observation learning is part of the learning of clarity” [30].

Therefore, we understand that self-awareness transits through the path of subjectivity and temporalities to compute reflectively about oneself in a construction-destruction-maintenance circle of ideas/concepts/virtualities that one has of itself. Self-awareness does not cancel subjectivity. Instead, it takes place due to this, returning to itself. In this process, inner environment communicates with the outer one, as well as in the reverse way in a spiral movement.

7.5 Final Considerations

“It is absolutely essential to explore the infinite capacity of fascination of human consciousness in order to make the re-enchantment of the world possible.”

BasarabNicolescu [31]

In the transdisciplinary perspective, knowledge is understood as a construction and search for self-awareness [32]. Thus, not being about pre-determined reason or already established, the possibility of a discussion on the role of education through creative exploration and knowledge construction is prior. This way, meditative silence of eastern inspirations as manifestation of human spirit may be a guide of

⁵The cogito begins to appear as a spiral ring. In a first degree it produces the objective “me”, which is trivial. In a second degree, it produces the self-identity of the ego-self, which is insufficient. In the third degree, it produces the “I am” of the “self-self”. We must also see that this circuit operates the passage from the objective “me” to the subject “I” and vice versa, basing them on each other [33].

movements towards self-awareness which retroact in the inner and outer being simultaneously, stimulating a transdisciplinary education.

The search for other epistemologies and ontologies may be significant in the field of Environmental Education, which is concerned with the diversity and socializing scientifically popular, ancient and spiritual knowledge of different peoples, ethnicities and areas of the planet. The transdisciplinary approach in Environmental Education may mean the strengthening and respect for diversities while it allows the meeting of knowledge and pushes the creation of the new.

For the field of Environmental Education, we understand that the most contribution of this study is the recovery of a meaning of non-duality as ethical foundation to think the relationship human-nature, inspired by Vedanta, whose idea of unity in diversity has been claimed for centuries. Politically, it may reverberate in different ways, as the claiming for creative times, and times for self-awareness and inner growing. These should be in the same basis of the human formation while we are stimulated to learn how to live, be and coexist, expressions that are frequently observed in texts about complex thinking. The discussion of a meaning of non-duality regenerates the search for fundamentals in Environmental Education, which is ruled by its own search for meaning of being and questions about which relationships we are creating among human beings and between human beings and non-human beings.

On the same way of learning to live and learning to be, Edgar Morin discusses Education's need to teach how to transform the knowledge into wisdom so that we can deal with our own mental, cognitive and psychic mechanisms in an integral way [34]. This exercise of search for integrativeness of the being may be favored by the self-awareness meditative silence in Education and also in Environmental Education. That is because human formations are not a heap of watertight knowledge that is centralized either in the subjects or in the objects. Rather, it is a dynamic process that places and (re) organizes those parts that are recognized in a complex network of individual and collective work.

The transgression of dichotomies, as matter/spirit, subject/object and human/nature, also needs to be understood in different contexts, such as the school. We may stimulate an integral comprehension of human condition, regenerating the meaning of being through supportive ethics and integration. This ethical meaning must be followed in our theoretical discussions of the environmental fields. Besides that, we have to notice how these discussions may create movements in society, culture and human formation as a whole, as well as the meeting with eastern philosophies may represent new inspirations along.

Beyond the world of opposites, we have to realize the unity, not putting variations of specific nature aside. The inner and outer world are phenomenal aspects of reality that finds unity in that – the subject -, the one who experience itself as a communicable bridge between inner and outer realities. The path to self-awareness is not abandoning one side and exclusively living the other one but finding a proper calculation which allows us to articulate its relationship. Moreover, the transdisciplinary vision is a search for transgression of duality, opposite to different binary peers, as subject and object, matter and consciousness, reductionism and holism, diversity and unity. As Nicolescu indicates, knowledge is neither inner nor outer, but it is simultaneous and needs to stimulate a non-resistance to this observation of an isomorphism relationship [35].

The re-enchantment of “the world of life” emerges as a way of resistance to the project which consolidates with the great western culture (based on separateness,

dishonesty and fear). When we search for other sources of wisdom and examples of relationships with the environment, as we find in native people and eastern wisdom, we reinforce the hope of a counter hegemonic praxis that is in same origin of the Environmental Education and its history.

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CHAPTER 8

Artistic Higher Education in Latin America: A Transdisciplinary vision

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Transdisciplinary methodology emerges as alternative to the methodology of the modern science, which has dominated in West in any process of knowledge legitimized by the academy. In the field of the artistic education, particularly in Latin America, also the same thing has happened and is alone in the recent years that perceive changes due to the offers of the artists from different disciplines (scenic, visual, etc.) those who have been opened to the multi, inter and transdisciplinarity propitiating new looks and, in consequence, new ways of conceiving the art. In this chapter I will present proposals for the Higher education of the arts based on the Transdisciplinary methodology that can offer to the students of art in the higher level the possibility of generating projects that come out his own discipline and that could be inserted in the complexity of the contemporary world.

Keywords: Transdisciplinary methodology, Artistic Higher Education, Latin America, live knowledge.

8.1 Introduction

The technological world has displaced the arts in the last thirty years. The technological culture lacks of the “real problems”, while, for the “real problems” of the countries such as marginalization, exclusion, unemployment, racism, illiteracy, criminality, the artistic practices (and artistic education) seem to be perfectly insignificant. Only they are kept as a symbolic legacy of the 19th century in the places controlled by powerful cultural bureaucracies [1]. Before this it is needed to grant another range to the concept of art, so that it continues being a space where the conscience kept awake.

Disciplinary fragmentation of knowledge’s has been favored in Higher Education with harmful consequences to the students and teachers converted them in people divided and with great difficulty to relate to all that is foreign to “its domain”.

The separation and the isolation of other areas of wisdom are the principal characteristics in the education and research of the arts – indeed of the research in general–. This is a result of our kind of approaching to the knowledge and the reality, product in turn of a rationalist – positivist vision.

We saw the unprecedented acceleration of the fragmentation of knowledge, a rejection of sharing knowledge, a lack of tolerance, a separation of science and culture and marginally in decisions on the society.

Any change, to be significant, will depart from a deep comprehension from the one who undertakes it and from that one that tries to change. Because of it, to speak about actions to help change the state of the artistic education implies changing, first, the way us we see ourselves, and how we understand the knowledge. It is necessary to formulate questions, to try answers and to do an different integration from the whole process with regard to the arts, for instance: what place to the education, research and practice of the arts in the national or local educational and scientific policies and in the attention of the institutions? and which has been its role in the generation of knowledge and social transformation?

The answers will be multiple and different, according each context, nevertheless, linking and creating spaces that arise from the straightforward effort from whom are dedicated to this activity will be possible to extend the access to the enjoyment and practice of the art as experience of knowing and human growth.

If the arts of the 21st century are orientated, on the one hand, towards the break of the borders and, for other one, towards the techno-cybernetic showiness, the Artistic Higher Education has to play a transformer role with regard to visualize and understands person, society and world.

8.2 Artistic Higher Education Actual Model

Now, the predominant model for the Artistic Higher Education and other disciplines in Latin America is the curriculum based in competences with a pragmatic, reductionist and technical vision whose goal is to register fragmented works and behaviors [2].

Formation of “effective” professionals, qualified for the elaboration, application and domain of techniques and procedures removed from any creative subjectivity and excluded from critical and reflexive thinking [2].

The problem is that the instrumental rationality that encourages the curricula through *competences* is orientated to dominate the reality and not to think about it. Nicolescu describes this situation “... as the increasingly impoverished inner identity is leading to the rise a new brand of obscurantism with incalculable social and personal consequences” [3: 147].

The being of the artistic education at the epistemic level and social function, are revealed today, more than ever, antagonistic.

The globalizing and neo-liberal perspective that promotes the expansion of the educational market sought to impose a managerial paradigm that led the marketing of the artistic education. Answering to the new cultural conditions consists on placing beyond all the determinisms that lead the arts to the mercantilization, towards turning into instrument for the alienation and submission of people, as well as considering artists and their public a privileged class.

How can the Artistic Higher Education respond to the 21st century challenges?

What reforms does the Artistic Higher Education need in order to offer an integral and open formation?

8.3 Alternatives

From such situation it is suitable to wonder which are the possible alternatives: Which is the role of the institutions in the area of education, research and artistic creation before today's challenges? What fields do the new objects of study in the arts constitute? What function do the arts have in the current society? How to change the vision in the Artistic Higher Education in Latin America? Is the disciplinary paradigm viable? What consequences has this paradigm generated?

From my own academic experience in Mexican Institutions from Artistic Higher Education, I affirm the urgency to move from a disciplinary vision to a transdisciplinary one.

I sustain that only with this change Artistic Higher Education, specially in Latin-America, it will be possible to offer an integral education for solving "real world" problems effectively and affectively, and contribute to a genuine social transformation.

On having observed the state of the art in what goes from the present century, I perceive a radical change respect on what characterized it during most of the 20th century. Because of it, in order to initiate a dialog between all the arts, and the arts with other knowledge's, it is urgent to stretch bridges that join, effective and affectively: the arts with the sciences, the arts with the tradition, the arts with the spirituality and, summing up, the arts with the society in its multiple ways of existing.

Transdisciplinarity is an epistemological proposal according to the principles of complexity that sees the advent of a human being capable of contending with everything that is between, across and beyond what has been considered as Reality. To understand its broad scope, it's necessary to apply the methodology proposed by Basarab Nicolescu, whose three pillars are: levels of Reality (ontology), the included medium (logic) and complexity (epistemology) [3].

A new vision in the Artistic Higher Education in Latin America from Transdisciplinarity requires a change of reference system.

1. Shift from the consideration of a problem as if it depended on a single level of Reality and place in the field simultaneously on different levels of Reality.
2. Renounce to wanting to find a solution to a problem in terms of "true" or "false" of the binary logic.
3. Recognize the inherent complexity of the problem, the impossibility of decomposing the problem into simple, fundamental parts. Replacing the notion of "foundation" for consistency.

How can arts and its practices, the scientific, technical and traditional knowledge -all of them products of intelligence and imagination of humankind- be available and beneficial for the human being?

8.4 Conclusions

If the purpose of artistic education is the elevation of the spirit, to achieve this requires linking all the knowledge and recognize that only from the human dimension will be at the service of mankind. For a better understanding of the world, artistic education must overcome the radical disjunction of knowledge across disciplines, and establish bridges between them.

The art, as a way of expression of the human being, can exist in a horizontal plane, or in the same level of reality where it responds to the succession of events of inertial way; but, if we take conscience of our being and the relations that we establish with everything that we perceive, we will be able to have the experience of the cosmic and conscious uprightness, that is to say of travelling simultaneously in several levels of reality. In this way the union of the Subject with the Object, that makes emerge the Hidden Third, will be possible, this is the goal of the transdisciplinary research as Nicolescu says [3: 56].

The arts that are generated from, for and for the community imply supporting the equity, the proportionality and the cosmic and conscious Uprightness. Only this way there will be able to generated projects of “live education” that involve body-mind-emotion-movement.

From the arts is possible to construct transdisciplinary bridges that connect all that that the disciplinary perspective has separated. The major challenge is how to establish a connection so that they aren't only multi or interdisciplinary bridges those who continue being constructed to support the disciplinary predominance.

The construction of bridges implies a permanent exercise of care, of affective and creative accompaniment, especially participative, where the principle of inclusion and the multi-experiential practices proper of the art will be present. There will be necessary to recover the sense of a *live knowledge* from the diversity and convergence among the different artistic practices of different cultures; for it will be necessary to re-measure body, sensibility and imagination.

Transdisciplinarity implies an ethical attitude of opening and dialog, because of it can stretch bridges towards the physical, emotional and intellectual balance of the Subject, bridges with itself, with others and with the nature to reconstruct, from the honesty and the commitment those social, environmental, cultural and affective ties that place the persons inside a studding of fundamental relations to understand and to promote their integral formation.

For that I consider value the propose from Sánchez- Pérez [2] about a methodology for projects as architectural center of the curriculum that, based on the research, flexibilizes and adjusts it to the needs and changeable characteristics of the program in formation. The projective nature of the curriculum must try the social, cultural and educational reconstruction to turn the forming ones into real protagonists, not repeaters nor imitators of forms or established models, but “authors” [4] with creativity and critical think. The research is the curriculum and the curriculum is the research in full development, which must be a collective construction around problems, needs, topics, experiences and propositions which boarding must come out any disciplinary pretension and give social, cultural and critical sense to the professional education by means of complex and transdisciplinary convergences.

Transdisciplinary artistic education must be seen as a permanent exploration movement that is the result of the open critical space that questions the artistic stage, its articulation with other disciplines and with life [5].

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CHAPTER 9

Artful Sustainability in Transdisciplinary Spaces of Possibilities

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Following up on my previous article on “Artful Sustainability” in the Transdisciplinary Journal of Engineering and Science, this article discusses artful approaches to the conduct of transdisciplinary research, to living a queer-convivialist art of life, and to the development of spaces of possibilities in society. The article is divided in four movements: First, seven plagues hindering transdisciplinary learning are discussed. Second, the qualities of artistic and arts-based research are reviewed, with a focus on the development of aesthetics of qualitative complexity. Third, a question is posed: What are the implications of aesthetics of qualitative complexity at the personal level? Moving my focus onwards to the personal lifeworld experiences of human beings, I advocate for a turn to a queer-convivialist life-art, encouraging a complex experience of the world where harmony through contradictions is embraced and played with. Fourth, I articulate the “real-world” relevance of artful approaches with the discussion of societal spaces of possibilities: shared physical, social and mental spaces where the search process of sustainability is activated through imagination, experimentation, challenging experiences, creative and participative learning, and prefigurative doing. Artful sustainability mobilizes art as a verb - a transformative force in society and a source of complex questioning that sharpens our ability to engage, through transdisciplinarity, with the world’s compounding challenges.

Keywords: Artful sustainability, transdisciplinary spaces, sustainable futures.

9.1 Introduction

The 2018 transdisciplinarity conference organized by TheATLAS asks the question of “being transdisciplinary”. Transdisciplinarity is first and foremost offering an improvement in our ways of *learning and knowing* the world, with the insights from knowledges and wisdoms from various human disciplines, as well as between and beyond those disciplines. It addresses seven plagues that reinforce each other and are hindering learning in contemporary societies. This is why transdisciplinarity is crucial to education for sustainability/sustainable development. Transdisciplinarity

is also offering its practitioners the chance to develop new and alternative ways of making their lives, to be and to become wisely, i.e. *ways of be(com)ing* that make up an art of living well. And most importantly for social transformation toward sustainability, this art of living is not an individualist matter, but an art of living well together. Transdisciplinarity is offering spaces of possibilities at the societal level, for human societies to become socially more just, economically fairer and more durable, culturally more enriching and inspiring, and ecologically more sensitive and response-able, i.e. *ways of doing* that contribute to a more sustainable human development.

Artful and arts-based approaches bring valuable contributions at these three levels of *being transdisciplinary: learning transdisciplinarily* through artistic and arts-based research; *be(com)ing transdisciplinarily* through artful ways of living; and *doing transdisciplinarily* through artful social practices that bring transdisciplinary affects and effects into the fabric of society.

9.2 Seven Plagues Hinder Learning for Sustainable Futures

Several forms of reductionisms lie at the root of further limitations preventing transdisciplinary learning. These reductionisms have been discussed at length by Nicolescu [1]. His analysis, when combined with Morin's [2] analysis of the challenges of education in the twenty-first century, points to a triple challenge of education for sustainable futures: (1) learning to perceive, understand and work with qualitative complexity; (2) learning to learn transdisciplinarily, with helpful epistemological approaches (for which Nicolescu laid the foundations) that allow us to reach beyond extended interdisciplinarity; and (3) learning to harness the potentials of humanities and the arts towards an artful approach to sustainability research (i.e. research that aims to contribute to social transformation for desirable and viable futures) [3].

Why those three challenges? I can identify at least seven reasons why this triple challenge is crucial to learning transdisciplinarily for sustainable futures. We need to overcome the multiple limitations, rooted in the reductionisms denounced by Nicolescu, that plague learning and knowing in policy, academia, business and civil society to this day: Seven contemporary plagues reinforce each other, and need to be overcome together, if we are to reform our ways of learning as well as our ways of be(com)ing and our ways of doing:

1. The first and most fundamental plague, at the root of the six others, is constituted by the multiple reductionisms that, among others, Nicolescu [1] discussed, and that are found across all sectors of society, including scientism, religions, political ideologies and philosophical orientations. These reductionisms compete with each other and antagonize each other, as much as they reinforce each other. Their common feature is to reduce the real to their specific single level of reality. Working together upon the way we learn, they lead to the fragmentation of knowing into insufficiently related cognitive experiences, and to the fragmentation of be(com)ing into autopoietic social systems (as diagnosed e.g. by Niklas Luhmann repetitively throughout his work [4, 5]).
2. Another plague that prevents learning transdisciplinarily is the widespread psychic numbness to the generative aliveness of the multiple ecologies we co-

evolve with. This numbness, as well as ways to overcome it, have been diagnosed by, among others, David Abram [6], Tim Ingold [7], Andreas Weber [8] and Wendelin Küpers [9], who all explore ways to re-sensitise humans through various forms of phenomenology. Weber calls for an “Enlivenment” as a corrective to the numbness brought about in the process of Enlightenment. Morin’s [10] principles of qualitative complexity, if understood and deployed in terms of aesthetics [11], also contribute to an “ecologisation of thinking” that nurtures Enlivenment.

3. A third plague is revealed by reading the analyses of discriminations made by various strands of feminism, cultural studies and social sciences. Taken together, they suggest the contours of a repeating pattern of Master narratives. These narratives are carried by disciplining normativities that prescribe societal normalization. These normativities are not only hindering divergent learning, but also causing multiple discriminations and injustices in society, that combine and/or conflict with each other in complex ways. (The recent research field of intersectionality focuses on these complex intersections of racialized, gendered, social-classist and other normativities and the injustices they foster [12].)
4. One specific plague that came comparatively more recently, over the past four decades, is the relatively new neoliberal economic imperative of self-optimization of individuals as economic actors, which also involves a commodification of aesthetics and creativity. The praised creativity of individuals and of a so-called creative class, narrowly instrumentalized in the service of economic growth [13], are not only contributing to unsustainable development: At the level of learning and knowing, this kind of creativity [14] also distracts from and discredits the everyday, everywhere social creativity [15, 16] and the experiential and embodied aesthetics of organizations and communities [9] that are so important to learning processes.
5. In parallel and in partially contradictory tension with the previously mentioned plague of the neoliberal instrumentalization of creativity, yet another plague is the disembodied intellectualism and top-down planning- & efficiency-oriented attitudes that still dominate among elites. These lead both to a lingering cybernetic illusion of managerial control [17, 18] and to an emerging reality of post-human algorithmic control [19] while weakening societal resilience.
6. A currently fast-growing plague, in full swing for some years, is the populist aftermath of a double-movement of monocultural closures and globalist flattening of cultures that characterize the unsustainable programs of ‘clash of civilizations’ and of the so-called ‘end of history’ (to which intercultural and transcultural responses in education and in an Earth-bound open ethics have provided some resistance but have been insufficient so far). Here, our ways of learning must depart from the habitual usage of delusional terms such as “cultural identities”: The diversity of cultures should not be considered in terms of the “difference” between self-contained identities, but rather in terms of productive “distances” between them, as argued by François Jullien [20]. What distinguishes the cultures that are more or less near or far, then, are not their respective “identities” but their respective “resources”, and these resources are available to all of humanity, transversally and transdisciplinarily.
7. Last but not least, the seventh plague I identify is the monopolization of human imagination by a dominant social imaginary of late capitalism [21]. This

dominant social imaginary thwarts the emergence of alternative imaginaries (whether alternative-capitalist or post-capitalist) that would better frame the search process of sustainable development. By obscuring the horizon of social imaginaries and numbing the imaginative capacities for learning, this dominant social imaginary hinders the needed transformations to address the compounding civilizational threats of climate change and unsustainable development.

These seven plagues can only be met if we address the triple challenge I named above. Transdisciplinary epistemology imperatively needs to be associated with a culture of qualitative complexity and to be constantly regenerated through artful processes and approaches.

9.3 Learning Transdisciplinarily: Qualities of Artistic and Arts-Based Research

Transdisciplinary learning is not opposed to disciplinary learning, but it implies breaking out from what I called a “cisdisciplinary” attitude to research [3] in terms of how we relate to disciplines, i.e. an attitude that either mistakes the situated and partly valid knowledge and learning made possible by any given discipline with a complete and self-sufficient access to knowledge of the world, or that is satisfied with merely fragmentary learning, juxtaposing disciplines next to each other. Cis-disciplinarity imposes a restraining self-identification towards disciplines and forms of regulation that hinder an opening to transdisciplinary research possibilities.

Artistic and arts-based forms of research and education contribute to a “trans-disciplinary hermeneutics” [22, 3] whereby a dynamic and complex relation between different ways of knowing and different ways of making worlds may be developed, away from the cisdisciplinary attitude. One of the ways this happens is through aesthetics of qualitative complexity [11], which are helpful in departing from the reductionisms and the other six plagues preventing transdisciplinary learning. Aesthetics of complexity is a percipience to the patterns drawn by qualitatively complex relations. Qualitatively complex relations, after Morin [10], are relations whereby various elements relate to each other in ways that are at once complementary, competing, antagonistic and belonging to a wider unitary process, without any single of these four relationships overseeing the others. Dealing with qualitatively complex relations requires a sensitivity to such relations and a capacity to work with ambiguity, ambivalence and uncertainty, not attempting to solve all perceived contradictions but understanding paradoxes and managing them – i.e. not trying to eliminate or solve paradoxes, but thinking through them [11, 3]. Logico-deductive thinking, though necessary to solve less complex problems, is largely insufficient and unable to grasp qualitative complexity.

The required complex thinking [10], put in service of sustainability, involves four aspects: (1) recognizing and working with emergence (rather than merely relying on planning and control); (2) integrating uncertainty and non-knowing into the trans-disciplinary hermeneutics [22]; (3) sharing partial views and acknowledging not only the value but also the limits of any expertise and any rational analysis; and (4) mobilizing the generative intelligence of desires and of imagination [23] for anticipation beyond the limitations of incremental thinking. Complex thinking for sustainability calls forward “question-based learning” [24] focused on enabling and “ennobling”

questions that highlight qualitatively complex relations and indeterminacy, rather than a problem-based learning focused on solutions that precipitate closure through finite answers.

Artistic and arts-based forms of research and learning allow such a question-based learning. The goal of research is then not to provide definite answers to defined questions, but to make research questions more interesting by deepening them. Artistic and arts-based research develop arousing, evocative and reflexively stimulating questions & symbols. As argued by Nicolescu [1], the arts are amongst the ways to decipher the world that help us reach the depths of complexity of symbolic thinking. Question-based learning then opens up multiple perspectives and multiple attentions at once.

Whereas “artistic research” is a term that characterizes ways in which professional art-making can constitute a form of research, “arts-based research” starts from the other end, i.e. usually social-scientific research, and characterizes research that involves the “systematic use of artistic process, the actual making of artistic expressions in all of the different forms of arts, as a primary way of understanding and examining experience” ([25] p. 29). In social science, arts-based elements can be involved in all phases of the research, including data collection, analysis, interpretation, and representation. It then affects our very ideas on the nature of knowledge and understanding. It introduces things that have been often kept out from the breadth of a researcher’s access to the world.

I already discussed at length the specific transdisciplinary qualities of artistic and arts-based research in a previous publication [3]. I am here summing them up more briefly. Artful research (whether artistic or arts-based research), involves embodied cognition. For example, the importance of the body in movement (kinaesthetics), of the senses (as also stressed in phenomenology), of emotions, of intuitions, of the subconscious and of tacit knowing for learning, are all recognized in the arts and can all be mobilized in artful research through embodied questions. The arts explore the space between what is known and what is not. They explore into darkness, while allowing ambiguities and ambivalences. They also enhance the awareness of the subjective self of the researcher as an author and as a story-teller. Thanks to artful research, one can take responsibility for one’s imagination and reflect on it, not just mindfully but also intuitively and corporeally. Artful research develops “imaginative investigations” ([26] p. XII) that articulate constellations of possible meanings, allowing a large freedom of ‘lateral’, associative thinking, working with lived experience. Empirically, artful researchers develop a heightened awareness of the multiple levels and processes of interpretation at play in perception and in further cognitive and inter-subjective communicative processes. They find and develop ways to express the kinds of knowledge that cannot be expressed merely by denotative writings. They can then also work on the bridges between sensory perceptions, human imagination, and social imaginaries (i.e. the “imaginary institution of society” [21]), thereby helping us confront the seventh plague hindering learning that I mentioned above. They put more focus than traditional research on contextual knowledge and include the audience/recipients of the interpretative work in the knowledge production process, contributing to a deeper, richer form of participative knowledge-production.

9.4 Be(com)ing Transdisciplinarily: A Queer-Convivialist Life-Art

Transdisciplinary becoming implies breaking out from the cis-cultural, cis-gender, cis-ethnic/cis-racialized, cis-normative attitudes to be(com)ing human. In other words, it breaks out from identitarian delusions of fixing definitions of the self and the other. It is a “be(com)ing” because it considers any being as a becoming (i.e. being alive is a constant process of becoming, as Tim Ingold [7], among others, discussed in more details), and it considers any self as an other too (Arthur Rimbaud’s “je est un autre”).

Art helps in this endeavour, not as a noun (to be defined, classified and compartmentalized by disciplines such as art history) but as a verb [27]: a transformative force in society and a source of complex questioning that sharpens our ability to engage, through transdisciplinarity, with the world’s compounding challenges.

Transdisciplinary be(com)ing encourages a complex experience of the world where harmony through contradictions, and tensions through apparent harmony, are embraced and played with. The aesthetics of complexity, which I mentioned above, are supportive of this.

Transdisciplinary be(com)ing queers good life (note that I am using “queer” here, like I am using art, as a verb, not as a noun). “Ce qui ne se régénère pas dégénère” (*what does not regenerate itself degenerates*) [10]. Instead of preserving one good life, the search for sustainability should be interpreted as inviting us to experiment with other lives, to open up to futures-oriented questions, and to queer these other, potential (good) lives, taking resilience as a moving horizon. Resilience implies an ability to learn from, and absorb disturbances, i.e. to be changed and re-organise, to co-evolve with the world, while developing an ethical societal direction such as e.g. the one sketched out in the *Convivialist Manifesto* around principles of interdependency and care [28]. Resilience requires redundancies, and not one blueprint of *the* good life. Transdisciplinary be(com)ing calls for a queering of convivialism, as I argued in an earlier publication [3].

As I mentioned above with Jullien [20], we need to question any lazy concepts of “cultural identity” and engage in interculturality and transculturally enriching experiences. Transdisciplinary be(com)ing opens up to indeterminacy and to learning through serendipitous life-experiences. It overcomes the pitfalls of the identitarian trinity of speciesism, communitarianism and individualism, while facing the necessity to be(come) response-able as a species, as communities and as individuals on this planet.

A queering life-art does not seek or bring certainties, comfort and clear borders. Instead, it fosters “uncertainties that stimulate de-normalizing and de-naturalizing aesthetic experiences and thought & embodiment processes. It is a process of hot distanciation and of ‘freaky desires’ [29] [...] keeping [the self] in a (warm flux of) intellectual, emotional and corporeal confusion, keeping ambiguities and ambivalences thriving” ([3] p. 155) for longer moments in one’s life. From such experiences “can arise more interesting queerings of ‘good’ lives, taking us to other desires, elsewhere than within the path dependencies of affluent consumerism” ([3] p. 155). Besides, a vigilant and chronic process of queering is necessary to ward us off away from the risk of a rigidified moralism, especially when transdisciplinary researchers and practitioners are seeking for the transversality of a sacred “Hidden Third” as suggested by Nicolescu [1].

Transdisciplinary be(com)ing requires “a constant reflexive work of de-normalization and de-territorialization of identities, without which the genestic potential of chaos (as discussed by Morin [10]) would be choked off” ([3] p. 155). Chaos is understood by Morin, not in its common-sense acception (which is reduced to the absence of order), but as an ever present genestic potential, throughout one’s life, which exists before, beneath and beyond both order and disorder. Artful approaches that bring inspiration here are guided by Guattari’s *Chaosmosis* [30]. For example, the philosopher and artist Jaime Del Val developed in his artful research work a utopian (or in his own words: “metatopian”) search for continuously amorphous processes [31]. Such an approach has clear discordian accents: The humorous and absurdist faith of discordianism is indeed centered on the idea that both order and disorder are illusions imposed on the universe (illusions that have a long history in world religions and sciences). To achieve a wisdom that reaches beyond what discordianism calls the “eristic” and “aneristic illusions”, i.e. the illusion of order and the illusion of disorder, discordianism is a half-serious, half-satirical antidote: It preaches a complex-chaos and humor-based approach to some of the deepest metaphysical questions. (To be more precise, order and disorder are, as Morin articulated in details, not illusions *per se*, but parts of the complex processes of de-re-organization of the universe [10]. The eristic and aneristic illusions lie in the belief-systems and cosmologies that explain away the complexity of the universe through a principle of order (or a principle of disorder).)

Transdisciplinary be(com)ing entices us to mobilize aesthetic sensitivities to living complexity even at the most intimate level with a convivialist & discordian eroticism that involves a reconciliation with embodiment through a queering of all aspects of our embodied lives, including a sex-positive approach to human sexuality. This can be helped by specific approaches such as queering gender, queering sexuality and queering our personal embodied lives, with a mix of corporeal practices that can be wisely brought in dialogue with each other, including especially Tantrism and BDSM (acronym standing for the ensemble of embodied, sexual and more-than-sexual, practices known as bondage, domination, submission and sadomasochism). BDSM is especially rich in the opportunities it opens up to experience deeply qualitative complexity and the complex unity of a *coincidentia oppositorum* at the most embodied, most intimate level of one’s life, beyond the clichés of dichotomic thinking (such as for example the dichotomic misinterpretation of experiences of pain-pleasure and domination-submission). Such a bold approach, combining BDSM, Tantrism, other embodied practices and the performing arts, is already being innovated by a few artists, as the exemplary case of the “Xplore Festivals” series created by the choreographer Felix Ruckert (in Berlin, Rome, Sydney, Paris, Copenhagen and Barcelona) have demonstrated time and again over the past decade [32, 33].

9.5 Societal Spaces of Possibility (in Everyday Societal Life & Public Life)

At the societal level, transdisciplinary doing is a shared practice, unfolding in the spaces where we work and live, as part of a lived “cognitive democracy” [10]. The practice of transdisciplinary doing is related to the notion of “Spaces of Possibilities” as shared physical-spatial, social and mental spaces where potentially sustainable futures are already taking some shape, emerging, and experienced in a prefigurative

way, in local communities. Together with colleagues at the Leuphana University Lüneburg, I carried out empirical research about such spaces over recent years, identifying their characteristics [34, 35]. Over the past couple of decades, other researchers also sought out the characteristics of such spaces. For example, the sociologist Erik Olin Wright characterized them as “Real Utopias”, which work as labs for sustainable futures when they manage to combine “desirability, viability, and achievability”, i.e. when they allow to dare to dream *and* to effectively experiment with alternatives in real life.

As we discuss at more length elsewhere [34, 35], spaces of possibilities combine:

- Imagination: they allow participants the unfolding of imagination (ideally a critical and radical imagination) of desired futures;
- Experimentation: not in the controlled science-lab sense of a scientific experiment, but in the sense of the artful experimentation of a desirable and viable everyday life;
- Challenging experiences that relate to various areas and issues in relation to everyday life;
- Creativity (in the sense of “social creativity”, combining individual and collective creativity) and participative learning;
- Prefigurative doing (i.e. prefiguring already today how the future *could* be) [36], and Gestaltung (i.e. a creative activity of giving form and shape while doing or making something).

Spaces of possibilities exist in a real geographic space that is (1) different from the mainstream and manifesting a spatial diversity; (2) both relatively open to the outside spatial environment and relatively closed (offering some protection for the experimentation going on inside); and (3) allowing a different, alternative experience of time to unfold (as one may experience for example at a festival, finding new rhythms and departing from the usual daily rhythms of one’s worklife). Therefore, these spaces share some characteristics with “heterotopias” [37]. However, unlike heterotopias, spaces of possibilities are not isolated: On the contrary, they are embedding themselves with the rest of the urban society and involved in transversal networking. They also relate to qualities of urbanity (as “third places” [38] encouraging the meeting with strangers) and are part of ongoing processes of place-making (i.e. activities that enrich space with symbolic layers of meaning, perceivable to others [39]. Through “entrepreneurship in conventions” [40], the actors engaged in creating and animating spaces of possibilities may be able to start unfreezing established social conventions and initiating a change in social practices. Such a change, however, requires further adopters and further processes of institutional innovations if it is to gain any wider impact [41]. Spaces of possibilities may play a pioneering role at the start of such wider processes of institutional innovations, i.e. social, cultural and political innovations altogether constituting transformative system innovations.

One of the challenges facing transdisciplinary spaces of possibilities, besides the complex dynamic of institutional innovations, is to also find a dynamic balance between dialogic and dialectic processes in the forms of social and political interactions that unfold in such spaces [42]. In a dialectic process (in a Hegelian sense), tensions between opposing views are resolved through compromises or argumentative resolution and/or synthesis. In a dialogic process (in a Bakhtinian sense), different views co-exist and respect each other’s difference, whereby oppositions remain open and unresolved. The challenge of a qualitatively complex approach is not to privilege

dialogic over dialectic processes as some proponents of 'mindfulness' may argue (or vice versa, as some proponents of agonistics like Chantal Mouffe [43] may argue), but to find a dynamic balancing and negotiating process whereby both tendencies are involved with shifting dominance.

Thanks to their integration of imaginative and experimental qualities, spaces of possibilities offer a real chance to overcome the dominant social imaginary of capitalism, which I discussed above as one of the plagues preventing transdisciplinary learning, be(com)ing and doing. Furthermore, thanks to their bottom-up democratic qualities, their fostering of emergent possible-solutions to problems, and the chance they offer to embody one's ideas and make things with one's own hands, spaces of possibility also offer an antidote to another plague I mentioned above, namely the disembodied intellectualism, top-down planning & efficiency oriented attitudes, and illusory obsession with control that characterize mainstream trends such as the so-called "smart city" developments in many cities of the world (which furthers the police-State surveillance and the infantilization of its citizens).

9.6 Conclusion

Transdisciplinary learning and knowing, when it moves in between levels of reality, "allows us to see unity and connectedness [as] a capacity we create inside of us" [22]. This quote points to what Nicolescu calls the "Hidden Third" as a way to realize unity in knowing. This unity should be understood not as a simple and obvious unity, and not as uniformity, but as "uniplurality" hosting greatly qualitative complexity. Otherwise, transdisciplinarity would tip into a dangerous form of holistic simplification, and Nicolescu's insights would be misinterpreted. This risk is not to be underestimated, as it re-emerges regularly, both among the proponents and opponents of Nicolescu's approach to transdisciplinarity: On the side of the opponents, I heard time and again the same misinterpretations of Nicolescu's thinking on religion, on the spiritual, and on the Hidden Third, that denounce a discourse in which they see a holistic pretension to reduce reality into a unified system (such misinterpretations however, can and should be dispelled by a more attentive reading of Nicolescu's work). On the side of the proponents, I noticed for example at the 2018 transdisciplinarity conference organized by TheATLAS that a few of the participants also seemed to misinterpret qualitatively-complex unity into something with too much uniformity. There, I noticed that this misinterpretation was in some cases directly connected to an underestimation or outright denegation of the importance of qualitative complexity as articulated by Edgar Morin. Thus, the triple challenge of education for sustainable futures, as I discussed it in section 1 above, is more urgent than ever, and should not be taken for granted, even among the communities of transdisciplinary researchers.

This unfortunate situation brings an additional argument in favour of artful and queer approaches to transdisciplinarity, next to the ones made earlier in this text: A crucial quality of artful approaches is to maintain tensions, discomfort, irritations and challenging experiences while moving in between and across levels of reality, working with symbolic thinking, and asking questions that evoke the Hidden Third without falling into the trap of a flatly holistic discourse (or even of a more sophisticatedly-flattening "Integralist" discourse). An approach that would be merely content with a too definite answer to the question of the Hidden Third, rather than keeping this

question infinitely open (i.e. an approach that would fail to make this question of the Hidden Third ever more interesting, as arts-based research usually does) would then fail to truly cultivate the deep existential questions that transdisciplinarity allows us to envisage. These questions, however, if asked artfully, may further inspire new developments activating transdisciplinary being at the levels of learning, of be(com)ing and of doing.

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CHAPTER 10

Transdisciplinary Theory of Mexican Agricultural Knowledge: Semiotics, Communication and Anthropology

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This chapter proposes a transdisciplinary model to explain the process of Mexican agriculture. It presents the results of a transdisciplinary study on wetland agriculture undertaken by the indigenous peoples of Xochimilco and San Gregorio south of Mexico City. The model also engages in a dialogue with three different types of knowledge: the first, corresponding to traditional or empirical knowledge, includes the three levels of reality (complex thinking); while scientific and technical knowledge corresponds to the second level of reality (simple thinking). When the three sets of knowledge create synergy, they produce the great semiotic system that explains their plurality and diversity. When communities self-organize at the ecological level, they conserve the agricultural production, traditions and customs constituting their cultural context. With the help of academic-technological innovation, they preserve their food, educational, sociocultural, and religious identity, and the creation of forms of government in keeping with their idiosyncrasy. These peoples have been able to survive in a world destroyed by genetically modified crops and food imports.

Keywords: Transdisciplinary, levels of reality, agri-culture, anthropology, food identity.

10.1 Introduction

Corn is one; the milpa many. Corn lectures; the milpa converses. Corn is autarkic; the milpa, supportive. Corn is a one-stringed instrument; the milpa is polyphonic. Corn is singular; the milpa, plural. Cornfields are disciplined like military parades; the milpa, as joyful and laid-back as carnivals. Corn is sown; the milpa is created. Corn is a crop; the milpa is all of us. (Bartra, 2014: 31) [1]

Agriculture in Mexico City is not a new activity in the urban environment. On the contrary, it is a productive process that contributed to the coherence of the Valley



Figure 10.1: Old map of the Valley of Mexico, painting by Miguel Covarrubias.

of Mexico, dating back to the foundation of the Great Tenochtitlán as the most important social, economic and ceremonial center in the region (see Figure 10.1) [2]. The urban nature of agriculture reflects the interests of the city in its evolution over time, particularly in the past fifty years, regarded as the period of its greatest expansion. This is how the modernity of the 20th century, despite its destruction of the environment and its tendency to homogenize, has enabled urban farmers to adapt technology to their own forms of production. This suggests a new rurality, in which territorial expressions derived from agricultural and forestry practices (urban and peri-urban agriculture) occur most frequently as a result of having established a relationship of reciprocal dependence with the rest of the country [3].

The characteristics of city agriculture in the surroundings of the Metropolitan Area of Mexico City include: (a) a predominance of smallholdings in agricultural activity; (b) restricted use of physical space in livestock activity; (c) recycled materials for the construction of animal housing; (d) garbage, food industry and household waste in animal fodder; (e) intensive use of excreta from dairy cattle as a source of organic matter, macronutrients (N, P, K), water and heat for agriculture [4]; (f) a predominance of local knowledge in productive technology and its oral transmission



Figure 10.2: Sale of agro-ecological products Photo: Students of the UAM-I.

and (g) the sale of products at local or nearby markets (see Figure 10.2).

Although some researchers have criticized the interest in the agriculture of city, because of its limited contribution to national food production and the regional economy [5], its importance lies in the incorporation of agricultural activities to improve the way of life of vulnerable sectors of the population and to reduce the “ecological footprint” of the city, by using elements regarded as having high waste entropy for productive purposes [6], which bring it closer to the new sustainability goals [7].

Wetland agriculture is the cultivation of gardens on platforms or artificial islets in lakes and swamps. It has existed and persists in various parts of the world and in Mesoamerica, there were examples of intensive agricultural production through topographical modification in wetlands. One of these areas is Lake Pátzcuaro, where evidence of canals and raised crop fields has been found in swamps dating back to the Early Classic period, exploited during the Tarascan Empire [8]. There are also indications of agriculture on raised fields in the central part of the state of Veracruz [9]. The most extensive Mesoamerican area of this type of agriculture, concentrated in the Valley of Mexico Basin, is known as chinampa agriculture.

Wetland agriculture allows excellent yields, since it takes advantage of the conditions that characterize these ecosystems, which combine fertile soils with the constant availability of humidity, meaning that they do not depend directly on the rainfall regime. However, their effective exploitation depends on the development of an agro-hydrological regime that is both suitable and sustainable. The system requires in-depth knowledge of the local environment and the adoption of a series of specialized agricultural techniques and care. These techniques vary according to geographical time and space.



Figure 10.3: Building a seedling nursery

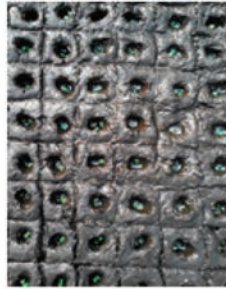


Figure 10.4: Chapines



Figure 10.5: Seedling

Photos: students from the UAM-I.

10.2 Agriculture and Anthropology

Anthropologists Ángel Palerm and Eric R. Wolf [10] have classified *chinampas* according to the technology of their construction as “inland chinampas” and “in-lake chinampas”. The first are those that are built on riverside land where the water table is more or less at ground level. In these cases, canals are dug so that the water penetrates the islets whose surface remains above the water mirror. Conversely, in-lake chinampas are constructed in shallow waters, as seems to have been the case in most of the Xochimilco and Chalco lakes. Archaeological research conducted in the past 50 years [11] and [12] and descriptions of the construction process provided by observers and scholars in the last century [13] show that the technique that predominated in what is now the region of Xochimilco and Chalco was the “in-lake chinampa”. The agricultural process in chinampas can be divided into several stages: sowing, growing, harvesting and transporting produce to the market.

Sowing (see Figures 10.3, 10.4 and 10.5) involves most of the crops in the chinampas that germinate first in seedbeds or seedling nurseries. Seedling nurseries are usually narrow and elongated, with a width of approximately two meters, which facilitates access to their surface from the sides. The base consists of a bed of dry plant material covered with a layer of water and mud several centimeters thick. Once the mud dries enough, it is cut lengthwise and widthwise forming a continuous grid of small cube-shaped blocks known as *chapines*, typically 4 to 6 cm per side, whose size varies according to the type of plant to be grown. A small hole approximately one centimeter deep is made in the center of each *chapín*, where several seeds are placed (their number depends on the type of crop) and covered with fertilizer. Once this operation has been completed, if necessary, the storage area is moistened again and covered with grass, large leaves or other protective material, with branches or stones on top to prevent them from being dispersed by the wind. Covering the seedling nursery encourages germination and protects the new plants from the birds, rain, sun, frost, and hailstorms common in the area during the winter months, while germination is encouraged by the heat generated and the decomposition of organic matter in the mud and fertilizer. The covering also serves to condense the humidity that evaporates from the chapines with the heat of the day, which usually happens at dusk. The humidity that has evaporated during the day and returns to the seedling nursery from the cover reduces the need to water it to maintain humidity.

Once the seedlings have germinated and are strong enough, the protective cover-

ing is removed and they are left to mature for several weeks until their size requires more space. When the *chapines* are ready to transplant, the weakest seedlings in each one are removed, leaving only the best ones, which is the reason why several seeds are placed in each *chapín*. The *chapines* are then easily separated by hand (since the blocks had been shaped at the outset), and transferred to the definitive field, with the required spacing between them for each crop.

This activity was undertaken in the model chinampa known as “chinampa apantle” of the Civil Association for Ecological Rescue and Civil Development (REDES) and the “Chinampa Apantle” producer group.

Since pre-Hispanic times, chinampas have been extremely productive agro-ecosystems that not only provide food for the population, but also help maintain a series of services such as recharging the aquifer, providing water, cleaning the air and regulating the climate of Mexico City. Like the milpa, in addition to productive aspects, the chinampa preserves the vernacular language, customs, rites and rituals.

One of the goals of REDES AC is to preserve the productive vocation of chinampas through agro-ecological methods to offer chemical-free food and increase food security through the creation of a “locavore network” (consumption of local products) linking producers in the lake area south of Mexico City with consumers. This type of agricultural process offers products for self-consumption as well as for sale, thereby encouraging the conservation of resources and biodiversity.

Agroecological products include aromatic plants such as coriander (*Coriandrum sativum*), parsley (*Petroselinum sativum*), epazote (*Chenopodium ambrosioides*), chamomile (*Matricaria chamomilla*), chives (*Allium schoenoprasum*), rosemary (*Rosmarinus officinalis*), dill (*Anethum graveolens*), mustard leaf (*Brassica sp*), arugula flower, mint (*Mentha spicata*) and mint (*Mentha L*) and vegetables such as Italian lettuce (*Lactuca sativa*), butter lettuce (*Lactuca sativa var. capitata*), and escarole lettuce (*Lactuca sativa var. Longifolia*), fennel (*Foeniculum vulgare*), rutabaga (*Brassica oleracea*), leek (*Allium porrum*), Brussels sprouts (*Brassica oleracea var. Gennifera*), cabbage (*Brassica oleracea*), squash (*Cucurbita pepo*), radish (*Raphanus sativus*), beet (*Beta vulgaris*), beet leaf (*Beta vulgaris*), carrot (*Daucus carota var. Sativa*), squash (see Figure 10.6) (*Cucurbita sativum L*), spinach (*Spinacia oleracea*), arugula (*Eruca sativa*), cabbage (*Brassica oleracea var. Capitata*), celery (*Apium graveolens*), Swiss chard (*Beta vulgaris var. Cicla*) (see Figure 10.7), edible greens (*Amaranthus hybridus*), pigweed (*Chenopodium album*), huauzontle (*Chenopodium nuttallia*), zucchini flower (*Cucurbita sp*) and romeritos (*Suaeda diffusa*), red corn (Zea mays) (see Figure 10.8).

The chinampas are protected by planters, spaces created by peasants who, through a combination of their empirical knowledge and scientific knowledge, create a set of integral practices that include the use of disease-resistant varieties, biopreparations, trap plants and repellents, in addition to biological and cultural control. In order to control insect pests it is essential to know their biological cycle, their natural enemies, the stage of their development at which damage occurs and when it is most susceptible, so that preventive measures can be used and effective controls carried out. The sustainable management of pests and diseases seeks to apply a set of comprehensive practices to crops designed to keep the pest insect population at a level that is not harmful to urban productive agro-ecosystems. We call this set of knowledge and behavior of flora and fauna biosemiotics.¹

¹Graciela Sánchez Guevara and José Cortés Zorrilla (2018), biosemiotic model for food production. The concepts are the product of as yet unpublished works that have been



Figure 10.6: Zucchini and cucumbers



Figure 10.7: Beets

Photos: Aldo Márquez



Figure 10.8: Red corn

Planters comprise several plants: **lemon verbena** (*Aloysia citriodora*), is a plant in the family *Verbenaceae* native to South America. It is grown for its aroma, which resembles lemon; **citronella** (*Cymbopogon*) a plant native to India, regarded as a pesticide with a non-toxic mode of action. It has powerful antifungal properties; **lavender** (*Lavandula angustifolia*). It is soothing and used to cure insomnia, irritability, headaches and stress. It is a disinfectant and used to heal wounds and burns, dry eczema, scales, sunburn, insect bites. An anti-infective, it cures colds, sinusitis and sore throats. It relaxes and soothes pain, reducing contractions and rheumatism, as well as being antiparasitic and useful for controlling lice; **Wormwood** (*Artemisia annua*) is a species of the family *Asteraceae* commonly called sweet wormwood, or Chinese wormwood; **rosemary** (*Rosmarinus officinalis*); and **daisies** (*Bellis perennis*), (see Figure 10.9 and 10.10).

10.3 Agriculture from the Perspective of the Semiotics of Culture and Communication

The XXI century requires one to conceive of phenomena and problem solving in a complex way, in other words, in an integral way to create a fabric composed of empirical, technical and academic knowledge. It is essential to combine several types of knowledge to recover and enhance traditional agriculture without the need to erode the land, aquifers or the environment as a whole. It is necessary to promote polyculture and eliminate the perverse interests of industrial agriculture [14]. In order to restore proactive, diverse and polyculture agriculture, we propose a transdisciplinary model of the Mexican agricultural process linking three sectors and multiple fields of knowledge. First, the field of empirical knowledge of peasant men and women, second the field of scientific knowledge of academics and third, that of technicians and technologists, respecting the sociocultural practices and socio-historical-political-cultural-ecological and environmental background of each of them. The three sectors

disseminated in several international congresses in 2018.



Figure 10.9: Constituent plants



Figure 10.10: Chinampa of planters in chinampas

(Photo: Aldo Márquez).

with their respective knowledge, information and experiences establish intersubjective and intercultural relations in their communication and become dynamic because there is an exchange of concrete cultural inputs such as technology transfer, linked to the symbolic exchange of messages. The socio-cultural communicative exchange between the three sectors defines homogeneity and difference, as well as proximity and distance. This reflects the identity and culture of the subjects identified in each of the components: agricultural, technical and academic. These three components include communicative relations (which) entail the construction of their own individual and collective identity, because people and groups are enriched by, receive, recycle and use them, modifying their ways of being and relating to each other in the short and long term, according to the type of human and social dimension involved [15].

From the perspective of *alter-native* communication, we propose alternative communication as the resistance of the original peoples that “drives them to a process of re-existence which implies the recognition of cultural diversity and difference, from an *alter-native* proposal of interculturalizing human society, as a decolonial project” [16] [17]. This communication establishes a dialogue between the three components, where cultural spaces are respected in order to permit a multiple discourse, because they begin from different positions: institutional ones - academic and hegemonic knowledge- those of farmers - empirical knowledge - and that of technicians - hybridization of academic and empirical knowledge-. In this tripartite relationship, symmetrical and asymmetric relations are not denied. On the contrary they mutually recognize and complement each other. In other words, according to Noboa and Albán in relation to the anthropological categories of *re-existence* and *alter-native*, we construct the category of alternative communication in the sense in which all the members of a chinampa are recognized in their socio-cultural, agricultural, historical, political, economic and environmental practices. This communication involves a transculturation of knowledge that shifts in language from the hegemonic academic center to the periphery or exteriority of the “other,” in other words, the farmer, the technician trained to train producers. This achieves technological transfer without overlooking the knowledge, customs and ways of life of the “other”, which not only achieves alternative and alter-native participatory communication, but also communication for another type of development.

From the perspective of the semiotics of culture, Lotman proposes the category of *semiosphere*, the space outside of which there is no semiosis or production of meaning

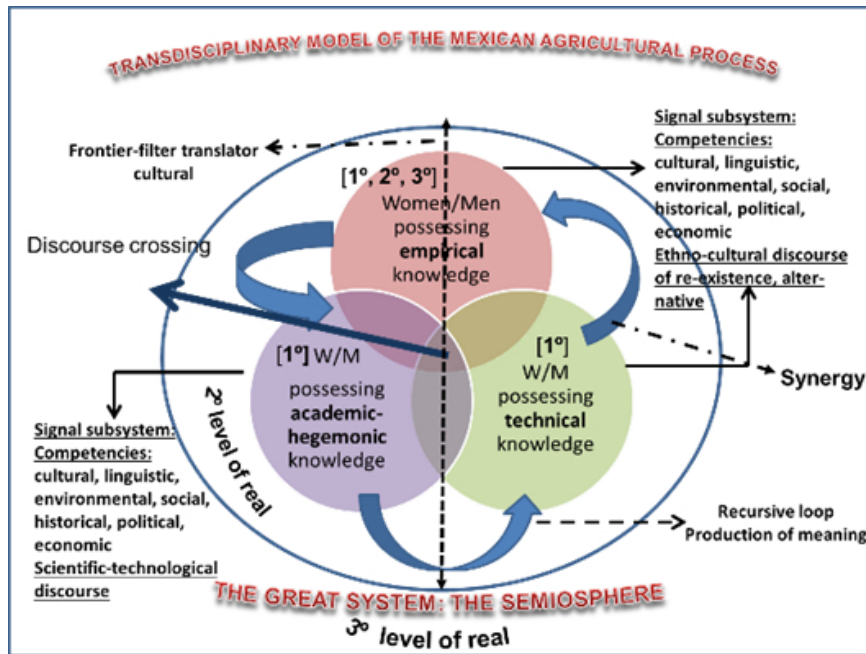


Figure 10.11: Transdisciplinary Model of the Mexican Agricultural Process.

[18]. The three sectors (see table 1) are considered as three semiospheres which, by breaking down their cultural borders, constitute the great agricultural system, the semiotic universe whose existence makes “the particular act of the sign” a reality. All production, both discursive and semiotic, within the agricultural field also produces a meaning for all members. Since each of the languages and texts referring to the countryside are particular sign acts, we therefore refer to particular semiotics, that is, to the subsystems of the ‘great system’. Consequently, the agricultural field represents the “great semiotic system” in which three components coexist and co-participate: institutions, farmers and technicians in turn make up sign subsystems.

Each semiosphere is characterized and dynamized by its intersubjective relationships and socio-cultural practices, in such a way that the subjects possessing hegemonic-academic-technological knowledge produce discourses and technical-scientific cultural products and transmit them to the group of farmers, which also constitutes the sign subsystem. In this great system, the three semiospheres are considered in an inclusive manner, together with their families in whose intersubjective relationships their rituals, food, music, and all their aesthetic, social, economic, and cultural productions emerge, which, although differentiated by their languages and codes, belong to the same subsystem and semiosphere. This happens because of “the coexistence of discrete verbal languages and iconic languages, in which system the various signs do not form chains, but are engaged in a relationship of homeomorphism, acting as mutually similar symbols” [19].

The discursive semiotic model (see Figure 10.11) regards the agricultural field as

the great system in which diverse subjectivities are incorporated and interrelated. It is an extremely dynamic system in which heterogeneities and homogeneities converge. Convergence is achieved through the border translating filters, which permit the entry of cultural elements so that they can be resemanticized. If this interrelation is achieved recursively and synergistically, then we are talking about the production of meaning that exists within each of the components and in their interrelationship with the other two, not only at the level of socio-cultural practices, since meaning is produced and biosemiotics also exists between plants. Planters are a clear example of biosemiotic production, because aromatic and ornamental plants attract insects and bees, and keep them away from the chinampas.

The semiotic-discursive proposal is that they are the subjects possessing empirical knowledge: Farmers with their wives and children who engage in agricultural work, who transmit their knowledge to subjects possessing academic knowledge: scientists and technicians so that they in turn will be able to process this knowledge and convey it to subjects possessing technical knowledge and the latter will return it to the first subjects, in such a way that all the knowledge is integrated, without exclusion. In this exchange of knowledge, the production of knowledge and information is operated and dynamized. The environmental, cultural and historical environment of the countryside and the city cannot be ignored. Consequently, the discursive production of farmers will be different from that of academics. It is therefore important to consider these discursive distinctions, as well as the semiotic production that operates primarily in cultural productions, such as, for example, objects: work tools for the farmer and the academic, used to create agricultural knowledge. All this set constitutes a complex semiotic-discursive system. In this dialogue of empirical-academic-scientific-technological knowledge, there must in principle be respect of the “other”, in such a way that the communication for another type of development effectively contributes to the improvement of the quality of life of members of the communities. This can successfully be achieved if *alter-native* communication is also respected, in other words, the communication of the “other native”, who at the same time re-exists. In other words, the farmer, the rancher, the farm worker and their families who work in chinampas and milpas or other models of agricultural production, must have their beliefs, customs, rites and rituals and worldviews, in short, their way of life respected according to their socio-cultural-historical-environmental-political context, so that they can produce their culture.

10.4 Conclusion

Finally, the dialogue between the knowledge of the three semiospheres proposed, in addition to representing a loop, recursively contemplates the entire complex of activities whatever their nature. In this respect, the semiotic-discursive model in its relation to alternative, *alter-native* participatory communication, performs its function for another development, which respects polyculture, natural diversity, through an articulated plurality of productive strategies, some for self-consumption and others for commercial purposes, including both native seeds and improved ones, which uses both monoculture and polycultures and leading-edge technologies but also ancestral knowledge. What cannot be allowed is for the excessive desire for profit, blind obedience to market signs, the logic of comparative advantages and the industrial agriculture model to continue to destroy agro-ecological diversity and thereby

socio-cultural plurality [20]. The proposed model hopes to be identified as a trans-disciplinary paradigm of synergistic divergence, “the virtuous interplay of activities and vital dimensions is what inspires the milpa, the chinampa, the *conuco* (small farm), the farm, planting by ecological floors and other traditional farming systems” [21].

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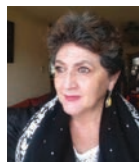
We are grateful to the members of REDES AC for their collaboration in this activity, as well as the “Chinampa Apantle” producers group. Special thanks are due to MSc Elsa Valiente Riveros, Ecological Restoration. Director General. Specialist in water resource management with an emphasis on species conservation. Financial and administrative management of ecosystem conservation and participatory community development projects through responsible management and practices. Project management involving academic and government sectors and society in general. Agro-ecological management of chinampas, Management of “Chinampa Apantle” model chinampa, application of agro-ecological techniques and ecotechnique with the aim of recovering traditional agriculture and promoting the conservation of biodiversity in the Xochimilco wetland. <http://www.redesmx.org/index.html#home19> 16°30.4’N 99°06’15.0’’W

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CHAPTER 11

Cybersemiotic Systemic and Semiotical Based Transdisciplinarity

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A transdisciplinary theory of cognition and communication based on the process self-organizing and autopoietic system theory of Niklas Luhmann integrated with a triadic semiotic paradigm of experience and interpretation with phenomenological and hermeneutical aspects of C.S. Peirce, goes beyond info-computationalism in its integrating of phenomenological and hermeneutical aspects of Peircean semiotic logic with a cybernetic and autopoietic systemic emergentist process view. This makes the emergence of mind and transdisciplinary view of sciences possible.

Keywords: Cybersemiotics, Transdisciplinary models, Luhmann's system theory, info-computationalism, Peircean triadic semiotics.

11.1 Introduction

The pursuit of a transdisciplinary evolutionary view of the sciences going beyond mechanicism and dualism has always been essential to systems theory and cybernetics, even though they have their origin in the natural and technical sciences. Therefore – like the logic positivist and their attempt of constructing a unity of science – they have severe problems of integrating qualitative sciences like phenomenology and hermeneutics [1, 2] as well as semiotics in their attempts to become truly transdisciplinary. It is the unsolved problem of a theory of mind, which includes qualia [3] that is a vital aspect of the problem. Furthermore even if that is solved, then there is still the problem if a science of experiential mind and meaningful communication beyond the quantitative and logical view of mechanistic science is possible at all [4, 5]. Bertalanffy [6] as well as Wiener [7] wanted to go beyond mechanicism. They both saw that the mechanical materialistic form of ontology that lies behind classical physics describes the cosmos as consisting of absolute abstract laws. Mechanistic science also denies the existence of experiential subjective consciousness and free will as having any causal influence on behavior and cognitive processes. That is paradoxical as experience and meaning based on natural language are prerequisite for any

science, no matter how much it escapes into mathematics [8, 9]. The problem is that there is no widely accepted definition of embodied social meaning in contrast to – Shannon or Wiener information. That makes the finding of formal semantic theory of information as difficult as defining an objective theory of information going beyond computer technology that does not include an embodied producer and receiver. It is my hypothesis that what we need is to enlarge our philosophical foundation with a realist semiotic process theory that can support a transdisciplinary scientific search for truth and a logic that encompasses embodied meaning.

11.2 How to Formulate the Problem

In order to be able to work with qualitative subjectivity and meaning production, we often see mechanicism being part of a dualism combining a mind independent world and a mental world. This ontology has pretty much been our common sense view in the West [10] since the start of the Enlightening period, when we strived to make the subjective more rational. However, concepts like “meaning,” “truth,” “intentionality,” and “knowledge” still do not have a rigorous explanation in traditional logic. They are part of another paradigm, the qualitative phenomenological and hermeneutical one as long as we are in a dualistic ontology or a pure materialism. Yet, there is an intuitive sense in which information is related to semantic content and meaning. So it is still a challenge to make sense of this semantic component, though it is the most central for humans.

This dualist mechanical view came into conflict with the spread of evolutionary cosmological ideas in physics and modern biology. This was because the mechanical model seems unable to encompass the view of evolution as a foundation process in a reality; which both physics and biology established as foundational for the scientific worldview. This role was then taken over by Thermodynamics [11].

The physical basis for this move was partially realized by Prigogine & Stengers [11] through non-equilibrium thermodynamics and in their break with the mechanical physics as the most basic physics to the advantage of non-equilibrium thermodynamics [12, 13] and much later Smolin [14]. The latter – inspired by Peirce – was promoting the idea of emergent developing laws manifesting as the universe develops and becomes more complicated. These changes in foundation of the sciences were supporting general systems theory and cybernetics holistic and self-organizing view of a scientific description of evolution. However, there was still the problem of mind.

In cybernetics, McCulloch developed the idea of the brain as a logical computer [15] leading into cognitive science and from there into the info-computation view that sees the nature, the brain, society, and the human as material computational entities; the brain being the hardware and the experiential mind as a product of the software a kind of language of thought behind the natural language. Even though Bateson [16] expanded this to his ecology of mind, cybernetics never created a full-blown phenomenological theory of the experiential mind to get out of the cybernetic information concept of form and matter.

Thus, we have various attempts at describing cognition and communication from a transdisciplinary point of view in a material world:

1. Info-mechanical processing with matter-energy and objective information as basic stuff of the world to which all cognition and communication is to be reduced. It is usually a realistic paradigm [17, 18] striving to go beyond the

Turing Computer. This view leaves out the conscious observer as the cause of experiences who can detect differences and make certain differences more important than others. Communication is seen as the transfer of objectively measured bits of information (further explained in [19]).

2. Constructivist approaches are developed by human beings with an experiential focus, which combines models on meaning and reality by give up realism for the sake of a dynamic relativism focusing on power and ideology instead of truth (further explained and discussed in [20]). Thus, paradigms 1 and 2 are not compatible.
3. A general systems and cybernetic view with emergence theory attempting to solve this problem through a theory of systems according to which the latter are more than the sums of their parts and in it self-organizations owns the possibility of qualitative emergence [21]. Still, we have no knowledge of a theory of qualitative emergence from matter, energy, and information to experience. Qualitative emergence is a nice idea but it does not really have a scientific basis.
4. Luhmann's integration of autopoietic second order cybernetic, Bateson's cybernetic mind-ecology [16] and general systems theory [22] make the individuality of systems a function of their self-limiting and self-organizing character through internal negative feedback systems. This production of closure though autopoiesis creates individuality and agency in biological, psychological, and socio-communicative systems, making objective information transfer alone impossible without any structural couplings. It is Luhmann, [23] that creates this triple autopoiesis theory. However, even structural couplings cannot count as interpretations because experiential cognition is not theoretically grounded in the theory. Nagel [24] also criticizes Neo-darwianan theory of evolution for lacking the theoretical foundation to be able to explain the evolution of mind in living systems. Qualitative interpretation and communication is simply not theoretically addressed in cybernetics and systems, be it in Bateson [16, 25] or Maturana & Varela [26, 27]. There is no phenomenological and hermeneutical foundation in the theories. It is not clear why Bateson's mind [25] or Maturana and Varela's biological autopoiesis [27] or Luhmann's [28] triple autopoiesis (biological, psychological, and social) should have any experiential awareness aspect, as the foundation of the cybernetic theory of mind is purely functionalistic. A combination of cybernetic, systemic and semiotic understandings of the semiotics of information, cognition and communication area seems therefore crucial to the development of a systemic Cybersemiotics that can support teaching and human development, because cybernetics and systems have not develop a theory of the origin of forms of meaning and qualia.

A Peircean view of reality includes both mind and matter as existing in the form of a complex network of continuous adaptive morphological forms or triadic sign functions. For Peirce view of logic is exceptional in that he consider logic to be semiotics "Logic is the study of the essential nature of signs. A sign is something that exists in replicas" (Peirce EP 2:310).¹ It means that Peircean semiotic produces

¹In according with tradition reference to **W**, **EP1 and 2**, **RTL**, **HL**, **NEM**, **MS and R** are to: Peirce, C. S. (1992). Peirce, Charles S., Writings of Charles S. Peirce: A Chronological Edition, Vols. 1-6 and 8, ed. (1981-2010) Peirce Edition Project, Bloomington: Indiana University Press.[**W1-W6**, **W8**]. Peirce, Charles S., Collected Papers,

a philosophy and scientific theory of signs meaning and materiality. A sign is an immanent dynamic producer of forms of signification manifesting in concrete signs like the letter ‘e’. A sign is a type that manifest in tokens, as there are many e-replicas on the page, but only one sign [29].

Peirce saw philosophy as the most general Branch of applied mathematics and the first discipline of philosophy as phenomenology. He agreed with Husserl that the first thing a philosopher should do was to study the most general aspects of experience and from here try to extract the most general categories [30]. Peirce in his phenomenologically and mathematically grounded philosophy was searching for a different way to establish those foundational categories that were so crucial to Aristotle’s, Kant’s and Hegel’s philosophies [29]. After much work [31] he ended up with three basic categories: the monad, the dyad and the triad. Peirce invented or produced a completely new list of categories [32] as the foundation of his phenomenologically and mathematically founded semiotics of logics.

When we talk about relational logic then its foundation is 1. The non-relative or singly relative, 2. The dual, and 3. The triple or polyadic relatives. Peirce simply called them Firstness, Secondness, and Thirdness. He determined Firstness phenomenologically as the basic feeling of qualities be it different colors, sounds or tastes. Secondness is the experience of resistance be it of matter or another mind, and Thirdness is the mediation between Firstness and Secondness aspects into the habit and understanding, the basis of his hermeneutics as a non-dual transdisciplinary paradigm.

Remark that he did not start in matter and energy as the basis aspect of ontology, but in (unexplained) raw experience. Here is a quote from one of the texts where Peirce shortly describes his three categories.

[...]by the “mode of being” of anything can be meant only the kinds of characters which it has, or is susceptible of taking, corresponding to the three kinds of characters, there must be three categories of things: first, those which are such as they are regardless of anything else, like the living consciousness of a given kind of feeling, say of red; secondly, those which are such as they are by virtue of their relation to other things, regardless of any third things, which is the case with the existence of all bodies, whose reality consists in their acting on each other, in pairs; thirdly, those which are such as they are by virtue of bringing two others into

InteLex electronic edition reproducing Vols. I–VI (ed. Charles Hartshorne and Paul Weiss, Cambridge, MA: Harvard University Press, 1931–1935), and Vols. VII–VIII (ed. Arthur W. Burks, same publisher, 1958). [CP 1–8] [CP. Vol and paragraph] Peirce, Charles S., Houser, N. and Kloesel, C(ed.) (1992). The Essential Peirce: Selected Philosophical Writings, Vol. 1, Bloomington: Indiana University Press. [EP1]. Peirce, Charles S., ed. Peirce Edition Project (Ed.) (1998). The Essential Peirce: Selected Philosophical Writings, Vol. 2 (Bloomington: Indiana University Press). [EP2]. Peirce, Charles S., ed. (1997) Turrisi, P. A. Pragmatism as a Principle and Method of Right Thinking, study edition of the 1903 Harvard Lectures on Pragmatism (Albany: State University of New York Press)[HL]. Peirce, Charles S., ed. (1992) Ketner, K. L. Reasoning and the Logic of Things, the Cambridge Conferences Lectures, with introduction and commentary by Ketner and Hilary Putnam (Cambridge, MA: Harvard University Press). [RLT]. Peirce, C.S. The New Elements of Mathematics; [NEM] v indicates volume number, p page number. MS and R: Peirce’s manuscripts unpublished in book or article form, transcriptions or facsimiles of them available on the internet identified by MS number. Most scholars use the MS numbers assigned by Richard Robin, sometimes preceded by “R” instead of “MS”.

*relation, as signs of all sorts are such only so far as they bring their
significance to bear upon the objects to which they are applied.*

(EP 2.427-428; 1907)

The idea is that that the universal forms of experience must correspond to the universal forms of thinking [30]. It is important to understand that in Peircean transdisciplinarity reality is not only material; it also includes possibility or ('would-bees'). He is very close to Popper's [33] propensity theory of chance. They both have the view that chance is real [34]. For Peirce the mind and social and communicative reality is as an important aspect of reality as matter and energy. Actually, Luhmann [22] in his autopoietic system theory also sees the social as communication. Peirce's triadic reasoning and dynamic ontology [29, 35, 36] and logic of relatives [37] goes far beyond what John Archibald Wheeler [38, 39] and Wheeler & Ford [40] developed through the scientific based philosophy of "It from bit", where information in the form of bits or even qubits at the quantum level is the most fundamental level of reality (discussed in more detail in [41, 42]). Ontologically, Wheeler's idea is that a quantum level existing below ordinary physical matter consists of information. Thus, information is in this philosophy ontologically more basic than matter and energy. It is the organizing aspect of the physical world. Matter is created from information (it from bit).

However, that does not explain the experiential mind either. Therefore, quantum neurophysiology has been developed and Penrose & Hameroff [43] have worked for many years to develop a quantum model of how the brain produces consciousness. Their theory is an alternative to computational mind [44, 45]. Computational mind in the form of AI has not produced conscious experience in the form of qualia that seems ubiquitous for embodied living systems' way of producing or reflecting conscious awareness. Neither natural nor computational sciences have been able to explain mind from matter, even though the quantum world do seems to go far beyond our common sense world. Recently, Thomas Fuchs [46] has written a much needed book: *Ecology of the Brain: The phenomenology and biology of the embodied mind*, which attempts to reformulate the whole problem through integrating a phenomenological grounding in a dynamic, evolutionary, and ecological view of the brain, in an attempt to break out of the mind-brain dualism with a mechanistic basis into a non-dual process view. As Peirce's point is:

No modern science is the study of the material, but of the immaterial contained in the material. Once men were contended with facts, and names, now, we always ask What is the meaning of this thing? Now the meaning of a thing is what it conveys.

(Peirce W 1:50)

Within Peircean semiotic ontology information is what a sign comes to carry in acts of semiosis. Semiosis becomes more fundamental than information, which does not exist prior to or apart from the sign that contains it. Information can therefore not be ascribed to objects that are not signs. To Peirce, semiosis is not only something that goes on in language, but is the transdisciplinary phenomenon that connects, nature, mind, and culture.

I define a sign as anything which is so determined by something else, called its Object, and so determines an effect upon a person, which effect

I call its interpretant, that the later is thereby mediately determined by the former.

(EP2, 478)

A sign is an action of mediation within the modes of being and organizations of mind as matter: “The one intelligible theory of the universe is that of objective idealism, that matter is effete mind, inveterate habits becoming physical laws.” (Peirce: CP 6.25). In that view, Peirce was close to Hegel’s objective idealism, but even more to Schelling’s philosophy, though differs from both of them in his empiricist semiotic borne fallibilist belief in that the self-corrective empirical testing carry our hypothesis in science towards greater truth [1].

Peirce - who was one of the pioneer developer of logical algebras [47, 48] - uses his triadic process philosophy to produce a general transdisciplinary triadic dynamic model of representation and signification. Here is one of his formulations:

In every genuine Triadic Relation, the First Correlate may be regarded as determining the Third Correlate in some respect; and triadic relations may be divided according as that determination of the Third Correlate is to having some quality, or to being in some existential relation to the Second Correlate, or to being in some relation of thought to the Second for something. A Representamen is the First Correlate of a triadic relation, the Second Correlate being termed its Object, and the possible Third Correlate being termed its Interpretant, by which triadic relation the possible Interpretant is determined to be the First Correlate of the same triadic relation to the same Object, and for some possible Interpretant.

(Peirce, EP 2:290; 1903)

Olszewsky [49] describes in a very short and precise way how this phenomenological, triadic semiotics constructs a bridge from perception through sign-based thinking and non-linguistic communication to language starting with the Firstness of immediate experience:

Phenomenological, nothing exists in the immediate present, which is pure possibility. This immediate firstness, to be actualized, must interact with a second, becoming part of an existent past, and can only be made intelligible by a third to interpret it. An interpreted event presupposes continuity and generality, and thus has implication for the future. It is by virtue of this implicative character that a meaningful even becomes a sign (text) to an interpreter. Thus even the most rudimentary and immediate experience must be semiotically informed to be consciously perceived. There is no thought without signs, and thirdness seeps into perception at every pore. On the other hand, thirdness is ontologically constrained by the limits of secondness and firstness.

(Olszewsky [49])

From this triadic relation logic Peirce built up the dynamic process-model of the sign. Peirce’s philosophy of semiosis is a realism that is not a materialism and not a systems theory (it is before systems theory), though it can integrate one. It is a process philosophy of the non-dual continuum of mind and matter. Peircean objective idealism is a synechism, as it posits a world of infinite continuity. It is

also a Tychism as its ontology posits a world of continuing activity. It has these two aspects in common with modern quantum field theory (Brier, 1997a+b) and, like physics, cybernetics, and systems, it has a main focus on form. Peirce wrote:

... there are two sorts of connection which do not involve anything but Matter and Form; namely, the determination of Matter by Form, and the blind reaction of Matter with Matter.

There are, however, forms of connexion of which this is not true. Such is the action of a sign in bringing its interpreter into relation with its object. Indeed, if we fully set before ourselves all that is involved in this action, we shall see that signification, meaning the action of a sign, covers all connexions of this description ... the very entelechy of reality is of the nature of a sign. One can hardly glance down a printed page without seeing a number of things, or individual objects, determined like this: the. These "replicas," as I shall call them, embody one and the same word. This one word is not an individual object. No more is it a thought, if by a "thought" be meant an individual act of the mind. Not being individual, it is not Matter. Nor is it, properly speaking, Form. For instead of being what it is of itself, and remaining altogether such as it is even if not connected with matter, the sign's mode of being is, on the contrary, such that it consists in the existence of replicas destined to bring its interpreter into relation to some object. A Form is a quality or character.

(Peirce NEM 4:297)

In Peircean triadic semiotics, semiosis is a relational dynamics that defines the basic process of mind becoming matter as 'instantiations'. Our universe is produced by a type-token dynamism going far beyond the conceptual linguistic human socio-communicative realm into the biological as well as physical-chemical aspects of reality [42]. For Peirce, the universe and its laws are evolving out of a "pure" "Zero" or emptiness in a vision close to quantum field physics, but still different from it with its basis in phenomenology [50-54]. Inspired by Aristotle, Peirce calls the directional force that drive semiosis to develop into self-correcting systems for entelechy:

This Entelechy, the third element which it is requisite to acknowledge besides Matter and Form, is that which brings things together

(Peirce NEM 4:295)

It is pretty close to the force of self-organization in general system theory, which you find as central in Laszlo's books [55-57]. Peirce's philosophy is not only producing an epistemology and a transdisciplinary philosophy of science but also a connection to a trans-religious spiritual philosophy [58].

The difficulty of getting Peircean semiotic production of meaning accepted is that it works on a triadic logical basis, where cybernetics and cognitive science share a dyadic form of logic with Saussurean semiology and its view of language as a system. But semiology lacks an empirical connection between the semiotic system and the rest of reality as it only works with signifier and signified in a system of differences with no direct referral to empirical reality ([59] for further argumentation).

However, Peirce's view of logic and semiotics is much more realistic and naturalistic in its universality than structuralist semiology. This is achieved empirically by a fallibilist use of signs, -of which only some are words - to form hypotheses

and then to determine a fallible but consequential truth through a hypothetical – deductive method. Peirce added n-adic relations to Boolean algebra in 1870, introduced quantifiers in 1880, and extended the algebraic notation to both first-order and higher-order logic in 1885. Peano adopted Peirce’s algebra and changed some of the symbols to create the modern notation for predicate calculus. In 1896, Peirce invented existential graphs (EGs) as a more diagrammatic notation for “the atoms and molecules of logic”, with a method that addresses the semantic issues of logic in a way that can be transferred to any notation. [36], because Peirce considered graphs as more diagrammatic than any linear notation. But he saw that there could never be a perfect way of representing continuity and therefore he produced many variations of Existential Graphs (EG). They are a diagrammatic system of logic by means of which, we can express, and then examine and experiment with, statements and inferences. The EG-system was invented by Charles S. Peirce in 1896, and, as developed by him, and it soon became a complete and consistent treatment of elementary logic. Still, Peirce is better known in traditional logic for his logical algebras and his pioneering work in the logic of relations [60].

More than a century ago, Peirce argued that there are unanalyzable three-place relations, and a relationally complete logic requires not only monadic and dyadic relations, but genuine triadic relations. A genuine triadic relation is a relation, which cannot be analyzed into combinations of relations of any smaller arities. Genuine triadic relations are three-relata relations. It is a commonplace of contemporary logic that there are no indecomposable triadic relations. However, as one of the major pioneers of the algebra of logic, Peirce contended that, besides monadic and dyadic relations, a relationally complete logic must also have genuine triadic relations that cannot be analyzed into combinations of relations of lesser arity to be able to model the simple relational function of A giving B to C. Furthermore, these three-forms can be combined to all higher order forms and therefore suffice for a complete logic of relations. But for Peirce, logic is not a part of a transcendental divine rationality as the old Greeks in classical time thought (Logos). He – on the contrary - views logic as rooted in the social principle and in contrast to the Turing-based info-computationalism, he *views the social principle as rooted in logic*. As a consequence of this pragmatist process philosophy Peirce views *logic as semiotic* and as the normative science of the right way of reasoning. This view is foundational for the communicative ethics of Habermas philosophy [61]. Peirce wrote about this relational logic:

The letters of the alphabet will denote logical signs. Now logical terms are of three grand classes. The first embraces those whose logical form involves only the conception of quality, and which therefore represent a thing simply as “a.” These discriminate objects in the most rudimentary way, which does not involve any consciousness of discrimination. They regard an object as it is in itself as such (quale); for example, as horse, tree, or man. These are absolute terms. The second class embraces terms whose logical form involves the conception of relation, and which require the addition of another term to complete the denotation. These discriminate objects with a distinct consciousness of discrimination. They regard an object as over against another, that is as relative; as father of, lover of, or servant of. These are simple relative terms. The third class embraces terms whose logical form involves the conception of bringing things into relation, and which require the addition of more

than one term to complete the denotation. They discriminate not only with consciousness of discrimination, but with consciousness of its origin. They regard an object as medium or third between two others that is as conjugative; as giver of - to -, or buyer of - for - from -. These may be termed conjugative terms. The conjugative term involves the conception of third, the relative that of second or other, the absolute term simply considers an object. No fourth class of terms exists involving the conception of fourth, because when that of third is introduced, since it involves the conception of bringing objects into relation, all higher numbers are given at once, inasmuch as the conception of bringing objects into relation is independent of the number of members of the relationship.

(Peirce: CP 3.63)

In Peirce's contention, the triadic function develops its morphological result by connecting relations, which are encoded spatial, temporal, and modal measurements, within that transformational act [62]. In Peirce's view, pure mathematics is the science of necessary reasoning about hypothetical possibilities. Rephrasing Taborsky, she suggests that one can view the three Peircean modal categories as referring to the quality of information.

Peirce sees Firstness as a mode of potentiality. Information in this mode is potential but not actual. Contrary to this, Secondness is defined as a mode of individual actuality. Information in this mode exists in a discrete and individual morphology – what Bateson [16] called a difference that makes a difference. Thirdness is defined both as a mode of generality, as habits and rules and other forms of necessity. Information in this mode exists as knowledge, understood as a substratum of normative conventions. It is a non-local mode and functions within both the internal and external zones. In short potential, actual, and necessary information.

Contrary to the info-computational view as well as cybernetics and systems relying on information as a fundamental concept, Peircean semiotic view starts out from a phenomenological ground for considering meaningfully interpreted cognition and communication [63], and combines this with pure qualitative mathematics. His pragmatism [64], functions as a theory of determining the meaning of a concept or a model [65]. Luhmann's systems theory and Peirce's semiotics have in common that information can only exist as part of a meaningful message whose informational contents are determined by the differences in knowledge between sender and receiver/interpreter.

But the concept of experiential meaning is not theoretically and philosophically represented in systems and cybernetics. On the other hand, semiotics is in need of a systems as well as cybernetic utopoeisis theory that takes into account the dynamism and self-organizing character of embodied systems' closure. Therefore, the integrated approach of Cybersemiotics is suggested as an enlargement to Peircean semiotics, which can make it able to deal with an embodied way of handling these aspects of logical reasoning [63, 2] because reasoning, for Peirce, is purposeful continuity of inferences and he understands logic as being semiotic.

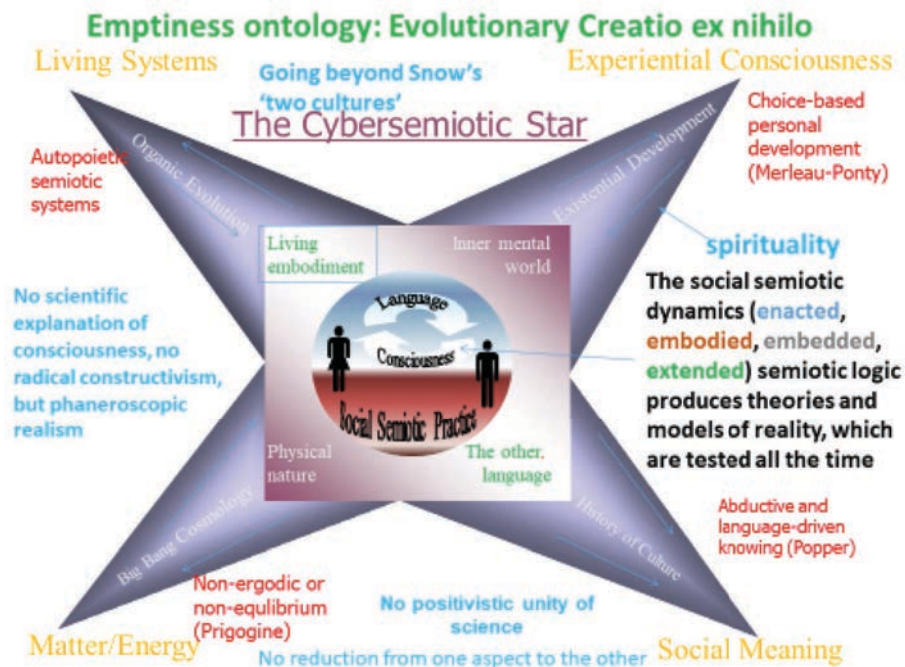


Figure 11.1: The cybersemiotic Star [21] The red arrows going out from the center are illustrating theoretical predictions that can be tested empirically. Arrows going back towards the center illustrates test result such as falsifications going back to force changes in theories. The center is where the embodied semiotic minds interact in language born socio-cultural practices that develops a cultures take on reality including an anthropology and a spirituality. It is an ongoing learning process on many levels as Bateson [25] has described.

11.3 Transdisciplinary Paradigms

Cybersemiotics attempts to combine a cybernetic-systemic and a semiotic view to amend the shortcomings of the above described transdisciplinary models to include theories of experiential embodied consciousness and meaningful communication in encompassing the area of the qualitative sciences. It does so by on one hand turning them into a model that is neither mechanistic in a totalitarian way nor confined to an algorithmic or physicalistic reductionism, and on the other hand does not lapse into a constructivist relativism by giving up all scientific truth claims. I have made a graphical model in order to make a one view possibility of the model (See Figure 11.1).

Cybernetics and systems sciences attempt to overcome these problems by means of their dynamic theory of emergence, according to which new qualities arise through the development of systems as in dialectical materialism or when two types of systems are integrated. From the materialism or info-computationalism that dominates the

natural and technical sciences ontology today the emergence of mind is a mystery. On hand, if matter were without mind, it would probably be chaotic pure low energy, not able to find its form as matter when the habits of the universe became law-like. On the other hand, what if we accepted constructivism as a pragmatic fact as in the hypothetical deductive method? It is us who creates the theories and scientific vocabulary to make explanatory theories world, and then accept a fallibilist realism like the philosophies of science developed by Popper [66] and Peirce, where we empirically test the theories, with only the possibility of proving them wrong. Thus, it is through meaningful and embodied semiotic and linguistic interaction with material, psychological and social reality that we create culture as a hypothesis of how the world's processes function. I suggest that, with regard to processes of embodied cognition and communication, the knowledge we cultivate falls into in four main areas: Firstly, the outer world often called nature, where one may further distinguish between a dead and a living part. Secondly, our view of the living part takes its start from the experience of our own bodies and empathy with other embodied beings and their ability to have bodily experiences of pleasure and pain. The third area comprises meaningful aspects like experiences and imaginations such as storytelling and phantasies, which in turn lead into the fourth area of communication and culture, where many of these stories are enacted and re-negotiated in concrete social contexts. Peirce wrote about the dynamics of the interaction of form and matter in the middle of the model to bring forth the four worlds:

We see that by the action of reason and will, that is, by the action of a sign, matter becomes determined to a Form; and we infer that wherever Matter becomes determined to a Form it is through a sign. Much that happens certainly happens according to Natural Law; and what is this Law but something whose being consists in its determining Matter to Form in a certain way? ...

(Peirce, NEM 4:299-300)

Cybersemiotics consists in suggesting a semiotic pragmaticist theory that takes its start from those contexts of social communication from which we create science (as 'the given') in the first place. In the model abductively produced explanations flow from the center towards the points of the star out towards the surroundings, where our theories can be falsified by the way things actually are – no matter what we think about them, as Popper and Peirce each suggest in their philosophies of science. However, the model also gives up the belief in the final verification of any piece of general scientific knowledge. The model does not work with any simple reductionist explanations – be they from physics, biology, phenomenology, or social constructivism (any of the points of the star). So, there is no reduction from culture to life or matter. As Peirce wrote, "I hold that truth's independence of individual opinions is due (as far as there is any "truth") to it being the predestined result to which sufficient inquiry would ultimately lead." (CP 5.494). His semiotic process philosophy shares with Prigogine's non-equilibrium thermodynamics as well as cybernetics and systems that it is a process philosophy of irreversible time in nature, life, mind, and culture, which contrary to mechanical physics considers the so-called 'laws of nature' to be emergent 'habits of nature', which manifest as the universe develops from nothingness [67, 68, 13, 14]. Peirce's semiotic world view has Tychism in common with systems theory and cybernetics and dialectical materialism as well as dialectical idealism (Hegel) in that there is a basic random dynamic at the basic

micro level as we also see it in modern quantum field theory, where all the spontaneous dynamism is in the vacuum field's virtual particles [69]. The theory's most famous non-technical explanation is Hawking [70].

The problem is that, as long as these different scientific paradigms do not have background philosophies that include experiential mind and meaningful communications, they cannot really connect evolution and ecology with human and cultural development, without producing a scientist explanation that is not a real philosophy. The reason is, that it is lacking an anthropological foundation that is consistent with its belief in that a group of humans – called scientists – is able to know the truth about aspects of the world. However, as Bruno Latour [71] claims with the title: *We have never been modern*, we have never been able to separate nature and culture really, as is also obvious from Peirce's synechism or logic of continuity [72]. As a concrete example, we can look at the so-called ecological crisis. What we consider natural landscapes are most often cultural products of our views of nature. That of course means that the ecological crisis is a cultural crisis. It is our problem as a culture that the honey bees as well as the majority of insects and therefore the birds in nature are dying off at accelerating rates.

So for Peirce, what information theory of Shannon & Wiener defines as bits, Bateson defines as differences that makes a difference, and Maturana & Varela claims has to be part of a structural coupling for an autopoietic system to put any signification on differences, Peircean biosemiotics says that when a difference is able to make a difference on a living system – as a species – then it is the definition of a sign. The difference is an object that is interpreted to have significance for the survival or pleasure of the species, or individual as part of a culture, its survive and flourishing human welfare.

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CHAPTER 12

Questioning the Transdisciplinary Education

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This chapter will focus on a few personal interrogations on the transdisciplinary education. The first part will be a discussion about the possible meanings of “education”. Education involves two essential components equally important: teaching and learning. The second part will summarize (in comparison) the main differences between these two sides of a complete educational process. In my opinion, teaching doesn’t exist (it’s absurd) without learning. But learning can exist without teaching. From a transdisciplinary perspective teaching and learning claim a specific relation between the Subject’s levels of Reality and Object’s levels of Reality which has to be reconsidered due to its huge complexity. The conclusions will consist in some interrogations on the future of the transdisciplinary education: Could the public system of education be transdisciplinary? Could we practice a transdisciplinary methodology in the frame of a disciplinary curriculum? Could the transdisciplinary teaching be taught?

Keywords: Education, teaching, learning, transdisciplinary education.

12.1 Introduction

The title of this chapter is not at all randomly chosen. The article is the result of my personal interrogations on this issue. After more than 15 years of learning about transdisciplinarity some reflections are necessary. These reflections came out from my both theoretical knowledge on transdisciplinarity and my practical experiences as well.

In Arad- the town where I came from- a lot of transdisciplinary projects were developed during the last 10-15 years. It is worth mentioning the two national conferences on transdisciplinary education in primary, secondary and high-school system in 2012 and 2013 and the transdisciplinary conference “Inner and Outer Light” in 2015, all honored by the participation of professor Basarab Nicolescu. Also, the *T Journal* was issued in 2012. It is the unique on-line journal in Romania dedicated to the transdisciplinary education in the pre-tertiary level. [1] “Moise Nicoara” National College in Arad encouraged transdisciplinary projects to be developed. The

last few years, they have been carried on in the frame of the European programs such as Erasmus. As a conclusion, the preoccupation for implementing the transdisciplinary methodology in the public education was permanent for me and my colleagues. We realized that the most difficult challenge is how to bring the transdisciplinary methodology into practice and also how to cross the bridges from theory to practice.

12.2 What Education Really Means?

The first question I should like to reflect on is concerning the concept of *education* itself. [2] Apparently, it seems that everybody knows what education means in spite of the fact that the concept had different meanings during centuries. Nowadays we could also find a lot of definitions of education depending on the perspective we approach the concept. For the recent educational philosophy, the question what “education” means, seems to be a source of some skepticism about the possibility of finding a proper answer. Here are some dictionary definition of *education*: *the process of receiving or giving systematic instruction, especially at a school or university*. [3]; *the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs, and habits* [4]; *the process of teaching or learning, especially in a school or college, or the knowledge you can get from this* [5].

So, should education be considered a matter of products (outcomings), a matter of *processes, topics, methods* etc.? Anyway, the modern concept of education is related to the ideology of European Enlightenment which brought into attention the idea of public education in order to give equal chances to learn to all the social categories.

Whatever the meaning of education may be, one has to admit that education implies mandatory two aspects: teaching and learning. “Teaching” was always focused to achieve the demands of the social needs synthetized in the concept of “Educational Ideal” which differs in space and time and has its specific design in each country. Learning was always focused on the students in order to get the information, the skills and values the society requires. But an obvious paradox comes instantly: teaching is absurd without learning! Teaching has no sense without learning but learning could exist without teaching. Talking about education, these two aspects usually are considered to be equally important but, in my opinion, they are not.

12.3 Teaching and learning transdisciplinary. Are there any differences?

3.1. First, I will try to put in comparison the main differences between teaching and learning - the two main important aspects of education, generally speaking.

In his book, *La fin de l’éducation*, Jean Pierre Lepri [6] tries to demonstrate the idea that the end of education is inevitable. [7] But the author has his own understanding and perspective on education. As he states in his interview [8], to educate means to consider yourself in the position of telling another person what the best for him is. To pretend to know better what is good for another human being means to consider yourself superior and to impose the relation master-slave between you and your students. Even when you are very well intended this doesn’t change

Table 1: Comparison between teaching and learning.

LEARNING	TEACHING
<ul style="list-style-type: none"> • Natural need for surviving • Natural ability (gift) • Natural environment • Acquisition of information, skills, values • Targeted to understanding the meaning of life (qualitative) <ul style="list-style-type: none"> - Life assessment - Natural validation • Continuous • INDIVIDUAL 	<ul style="list-style-type: none"> • Artificial need of social integration • Acquired ability • Artificial environment • Delivery of information, skills, values • Targeted to achieve compulsory scores (quantitative) <ul style="list-style-type: none"> - Social system assessment - Social validation • Discontinuous • SHOULD BE INDIVIDUAL

the real nature of this relation. The relation remains one of inequality, asymmetry and hierarchy. The pair “dominator/dominated”, “master/slave” remains constant. A possible correction of this anomaly could be fixed by moving the accent from “teaching” to “learning”. (fr. enseigner/apprendre)

That’s the reason why Lepri makes a major distinction between teaching and learning. [9] Taking into account his considerations, I tried to summarize the main differences between teaching and learning in Table 1.

According to this table, the capacity of learning it’s a natural gift for every human being. Learning is natural like breathing. Learning represents a natural need and ability, an absolute necessity for human beings to survive. Learning is an inevitable process, it’s free, unbounded and impossible to be limited or forbidden. It generates joy and the fullfeeding of every human being in his effort of understanding the meaning of life. Learning doesn’t need an artificial environment, designed by educational system. It could take place everywhere, any time. That’s why we are talking about the concept of “lifelong learning”.

On the other hand, teaching is an artificial process, a conventional and circumstantial process claimed by the social need. The human being must be integrated in the society so, he compulsory needs to acquire certain abilities designed by the official curriculum. Teaching needs an artificial environment consisting in limited space (the classroom mainly) and limited time (50 minutes or more) according to the institutional rules. The topics are also limited to the ones designed by the disciplinary curriculum far from the personalized needs and interests of an individual. So, the student has restricted liberty in choosing his own domains of interest and is demanded to learn according to the school schedule. Unfortunately, teaching is focused on *delivering* information, skills and sometimes values but learning is focused on active and continuing *acquisition* of information, skills and values according to the student’s interest. Long ago, Confucius made a well-known statement: the more teachers “teach”, the less students have the possibility “to learn” something.

There are also a lot of differences between teaching and learning considering the targets of evaluation. As said before, the main target of learning is to understand the meaning of life. So, the core of learning is qualitative. The acquisitions of learning will be confirmed by life itself. Only passing “the exams” and “the tests” of life the human being can achieve his happiness and completeness. On the other hand, teaching as a social introduced process is targeted to achieve some compulsory

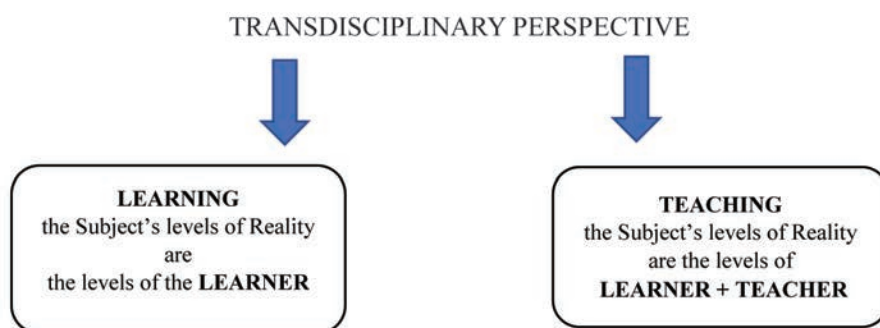


Figure 12.1: Transdisciplinary perspective on teaching and learning.

scores according to a designed scale. It “measures” the acquisitions of learning in a quantitative manner at just a certain moment of students’ evolution. The social system assessment can bring only a social validation of the students’ education at a certain level. A student could be brilliant in his academic scores but could easily fail in his life.

As a **partial conclusion** what I can briefly stipulate at this moment is that learning is continuous and vital, but teaching is discontinuous and not absolutely necessary. Learning is a strict individual act with or without teaching. This statement requires answers to the following questions: can we learn without teaching and outside the institutionalized system of education? Would it be better or worse? Why the actual society continues to keep the old pattern of education in spite of the obvious crises of education everyone agrees on? Which could be the social -political strategy acceptable and accepted to re-think and re-form the actual concept of education?

3.2. If we agree on the previous statements on learning and teaching, a new problem occurs. What will be the effects for the concept of transdisciplinary education? (TD education) respectively TD learning and TD teaching. In this perspective, the relation between teaching and learning claims a different approach.

In the frame of the educational process there are two important actors: the teacher and the learner. The direct individual contact between the teacher and the learner is crucial. Because from a TD perspective, we are talking here about a dialogue between two Subjects who have their own distinct levels of Reality (see Figure 12-1).

So, the Object’s Levels of Reality (Objective Nature) come into a relation with two different Subjects who each actualizes their own Levels of Reality (Subjective Nature). Trans-Nature crosses all the components involved in this process. This is a complex relation due to the fact that the Subjects (the teacher and the learner) interact as well in the frame of a didactic process trying to build up a dialogue. Could we consider this didactic dialogue being transdisciplinary? In my opinion, we could, but not in a public system of education! That opinion may appear strange and may be not “politically correct”. But I will try to explain my assumption. The teacher must interact with every student -individually- in order to build up a transdisciplinary dialogue. This is not possible in a classroom full of 20-30 learners who are listening simultaneously to the teacher. An authentic TD dialogue can’t be

performed in such conditions.

Learning is transdisciplinary by itself. Teaching is not. All the arguments were pointed out in the first chapter of this paper. Learning is natural, and it involves simultaneously the body, the mind and the soul. It is targeted to understanding the meaning of life and crosses over the simply acquisition of knowledge, skills or values. Learning is transdisciplinary because it incorporates a lived experience. The four pillars of education UNESCO has stipulated [10] could be achieved only by an individual learning and not by a simply teaching delivery. Teaching could only facilitate the learning or contrary.

Learning is individual. Teaching is not. In the public system of education individual teaching is not possible. That is the reason why the modern sciences of education make efforts to implement the concepts of “integral education”, “education centered/focused on students”, “personalized teaching”, “home schooling” or develop alternative pedagogies like Montessori, “step by step”, Waldorf etc. These attempts are a living proof for the recognition of the failure of actual public system of education. There is a desperate effort to correct what is missing from the public system of education. If we consider learning an individual act, then teaching should be at least the same like in the ancient times when every learner had his own mentor (a huge difference emerges between “a mentor” and a simply “teacher”).

Analyses on the difficulties and obstacles, I was confronted with in my attempt to implement the TD methodology in the public system of education, could be found in my previous publications [11]. Among these difficulties I’d like to mention the following: the coercive force of the public system of education totally inadequate to the TD practice; the assessment system’s incompatibility with the TD goals; the lack of qualified human resources able to implement a TD teaching-learning process; the impossibility for teachers to work formally as a team during the class and the resistance, opposition of the collective mentality to any kind of change. It is, in fact, the refusal to change a structured curriculum which was practiced disciplinary for centuries and to reconfigure the whole paradigm of education.

A radical position against the public system of education was taken by John Taylor Gatto in his book whose title is suggestive itself: *Dumbing Us Down: The Hidden Curriculum of Compulsory Schooling* (1992) [12]. The author criticizes the compulsory public schooling which is considered to be the main enemy of real education. He makes a clear distinction between “education” and “schooling” (without using the concept of learning and teaching). “Schooling” covers just partially the concept of “teaching” as it is used in this paper. J.Taylor Gatto observes that the more standardized and expensive schooling becomes, the less educated the people are. In an interview from 2017 [13] he made an important statement which was developed in all his books. The real target of compulsory schooling is conformation, obeying and conditioning. Practically the form (the structure) of public schooling is its own content. We are thought to obey, to be “politically correct” and never doubt about the “system” because the society needs us to be predictable. Unfortunately, these targets are quite opposite to the transdisciplinary ones.

12.4 Conclusion: Facing the Future

The 21st century society must admit the failure of the public system of education as it was structured during the latest centuries. It is obvious no matter which perspective

or statistics one accesses. It's a total failure on a social scale but most of all on an individual level. The main dangers for the human future society were revealed by Professor Basarab Nicolescu in his latest publications and conferences all over the world: the anthropocene, the artificial intelligence and pan-terrorism. [14]. So, an imperative changing is urgent. The transdisciplinary education could be a proper solution all over the planet.

A few years ago, Harvard issued an advice to those planning a career in the global economy of the future. It identified 10 qualities to acquire according to the changing standards; none of them is usually found in the frame of actual public schooling: "1. Ability to define problems without a guide. 2. Ability to ask questions that challenge common assumptions. 3. Ability to work without guidance. 4. Ability to work alone. 5. Ability to persuade others that yours is the right course. 6. Ability to debate issues and techniques in public. 7. Ability to re-organize information into new patterns. 8. Ability to discard irrelevant information. 9. Ability to think dialectically. 10. Ability to think inductively, deductively, and heuristically". [15] But I must underline the fact that this absence is only related to abilities/skills. What about the acquisition of information, the beliefs, the attitudes, the principles, ideas, the needs of human soul? What about the ability of making moral decisions or the ability of "awareness"? The integral education of a human being is far from being possible in the public system or "compulsory schooling".

The main causes, as they were explained in this paper, concern the specific relation between teaching and learning: *learning is individual/teaching is not; learning is transdisciplinary by itself/teaching is not; so, education cannot be transdisciplinary in a public educational system.*

A possible suggestive analogy could be made. According to the Christian religion, Jesus Christ is considered to be the "Supreme Teacher"; his disciples used to call him "teacher". (same was Buddha or Mohamed). During his incarnation, he tried to teach people how to live together according to the Christian laws. But his "public teaching" was not enough. The people didn't understand. He had to select some disciples and to teach them individually according to their personalities and life experience, because every person is unique and receives the message in a different manner. So, teaching takes time and could be useless for some people even if they have the perfect teacher. Every "learner" must understand for himself during his permanent effort "to jump" on a next level of Reality. Some will succeed, some not. What I am trying to underline by this example is the fact that the teacher /mentor/guru is important, but learning is strictly individual and does not depend on any "perfect" teacher whoever he may be.

Coming back to the title of this paper, my main concern was to set up some interrogations upon transdisciplinary education; questioning is the first step to mark the problem, to bring the attention about it. My intention was not to find or give the answers to these interrogations but to make people realize the difficulties the transdisciplinary education is pointing at. Questioning the transdisciplinary education generates some moments of reflection on the modalities/ways it could be implemented or not in the actual paradigm of education. In my opinion, the following questions are waiting for urgent answers:

1. Could the public system of education be transdisciplinary?
2. Could we practice a transdisciplinary methodology in the frame of a disciplinary curriculum?
3. Could the transdisciplinary teaching be taught?

Everyone is invited to answer these questions and to find his own answer. According to my practical experience, I must confess that I crossed two distinctive moments. The first one was optimistic, full of enthusiasm and amazing hope that the transdisciplinary methodology could be implemented in the “official” system of education in Romania as well as all over the world. After some years, I realized this is quite impossible. A radical changing of the paradigm of education is imperiously needed. But I strongly believe that only the transdisciplinary education could be the solution to the 21st century society and could offer its salvation from self-destruction. I’m afraid that the politicians and the decision makers in this world are not yet prepared for such an amazing “gift”.

To conclude, I shall paraphrase a wise Chinese saying: “I have only opened a door, but everyone has to enter it alone and to discover what is beyond it!”

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CHAPTER 13

Renewal in the School Garden: A Transdisciplinary Educational Experience

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The purpose of this chapter is to explore the highest meaning of a transdisciplinary educational journey which a team of teachers from “Petru Rares” National College, Suceava, Romania, have embarked on over a period of approximately 2 years. I will make reference to the need that motivated them to take action, and the complex strategies they used to achieve the expected results. Considering the overall picture of this transformative learning process, one can observe significant improvement in students and teachers’ level of perception, revealing that the majority of the participants in this project have enhanced their ability to be in harmony with themselves and the others. They have gained knowledge not only about the outer world, but also about how to “arrest” the mind so as to be in a moment of discontinuity, enjoying the tremendous sense of being together and making the most of their creative potential.

Keywords: Transdisciplinarity, transformative education, school garden, consciousness.

13.1 Introduction

Being a teacher means, above all, experiencing a profound connection with one’s students, which implies humility and greatness in the same time. This way of being also involves understanding young people’s wonder, the vision of their potential so as to create through every thought, word and gesture our inner and outer garden. Keeping in mind and heart the beauty of these thoughts, we began writing a wonderful story which was meant to help students, teachers and parents ask the right questions, broaden their horizons and create the “text” of their existence in a way that is timeless, speaking to all of us at a deeper level. Awareness was followed by a flash of inspiration, perfect in its simplicity, from which the narrative structure began to emerge, with beginning, middle and ending, connecting elements, a whole symphony of presence.

After research and experience, we were guided towards the project of Transdisciplinarity and realized that it has to be part of the teaching and learning process at all

levels, and since it is something students and teachers need to grow into, designing lessons for the open space of the school garden, focusing on the elements of nature, seemed the best idea [1]. Language arts, mathematics, science, philosophy were to be integrated but through all these big questions were to be asked and reflection was to be conducted so that, as Patrick Geddes points out, Head, Hand and Heart could be in harmony [2].

13.2 School Garden Project Implementation

Thus we embarked on the adventure of an Erasmus + project¹, which offered the perspective of international collaboration with the aim of gaining competences for applying the cultural construct of outdoor education in a transdisciplinary manner. We analyzed the need of the school using a questionnaire meant to identify the need for institutional development as well as the teacher's interests concerning training programs. We have learnt that the majority of the teachers are interested in inter- and trans-disciplinary domains, implying alternative and complementary strategies of instruction, research and innovation.

As for the students, we have conducted a survey referring to the students' level of connectedness with nature. To this purpose, we have used the Mayer and Franz Connectedness with Nature scale [3], which describes what represents an essential predictive element of responsible behaviour towards nature. The survey participants indicate their level of connectedness with nature using a scale from 1 to 5, in order to establish to what extent they are in agreement or disagreement with 14 statements reflecting emotions, values, norms, the correspondences between cognitive and affective levels. All these represent areas of change that can be shaped and harmonised by educators by applying the principles of outdoor education.

As a result of interpreting data provided by this survey, we have reached the conclusion that numerous students do not live in accordance with what they know, as 40% of them demonstrate a low level of perception, manifested through reactive, instinctive gestures in their interaction with the others and the natural environment (see Figure 13.1). 30% of the respondents scored between 40 and 60 points. For these students, there are particular situations when perception is intensified due to factors that enhance interiorization of meaningful nature experiences. 30% of the participants obtained scores ranging from 60 to 70 points, indicating a high level of perception. In their case, due to the experiential component of the education they have been offered, in balance with the knowledge and understanding accumulated in school or through other cultural practices they have been exposed to in their families, their moral centre is in harmony with their intellect. Consequently, they feel motivated and inspired to manifest responsible behaviour towards nature.

Considering the data presented above, our endeavour had to focus on two essential dimensions of learning, simultaneously involving the exploration of the outer world and embracing the inner realm, thus cultivating awareness of the beauty one can absorb and be absorbed in.

In brief, implementing the project means for us creating and sustaining the culture of respect for nature, lowering the number of students with a low level of perception by at least 10% and increasing the number of students with a high level of

¹Erasmus+ 2016-1-RO01-KA101-023553 school education "New perspectives on authentic learning by applying transdisciplinary approaches in outdoor educational processes"

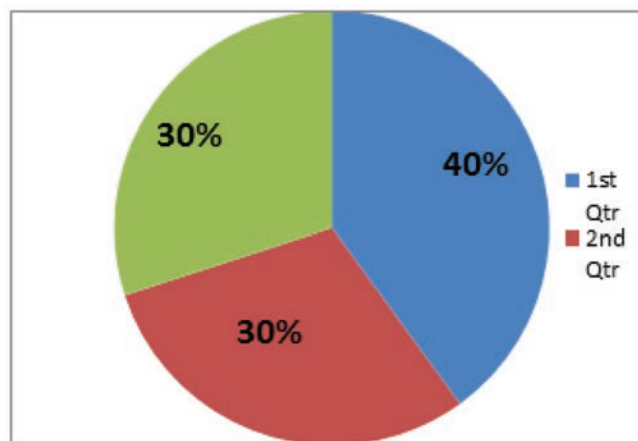


Figure 13.1: Level of connectedness with nature of students from “Petru Rares” National College measured through the Connectedness with Nature Scale (Mayer & Franz, 2004).

perception by at least 5%, generating motivation and inspiration for involvement in environmental protection activities.

In continuity with the educational programmes offered to teachers in partnership with outdoor learning centres from Sweden and Greece, the project we have initiated aims to extend the existing frame starting from local interpretive contexts. Thus, students and teachers further explore what it means to feel at home in nature, observing symmetries between structures, discussing the diversity and validity of experience in different socio-ecological systems. Additionally, students learn about traditional knowledge related to the protection of the environment and the cross-cultural understanding it offers. Eventually, a synthesis of these findings is achieved, incorporating into a coherent structure the interrogations that reveal the causes of present lack of balance, continuing with coherent investigations of the present representations with regard to the issue of sustainability. It is also essential to create the powerful moment of reflection that brings the energy and determination to come up with solutions and work hard to overcome obstacles.

As a result, for both students and teachers personal development is anchored in meanings higher than themselves. They work together to create the final products of this project:

- 5 outdoor educational areas in the proximity of our college;
- 100 educational units destined to be taught in the educational areas in an interconnected manner;
- non formal activities to practice ecological communication;
- didactic materials for school decision curriculum such as Drama Games in Nature, Stories in Our Garden, Landscapes and Legends, Guide for Outdoor Non-formal Activities.



Figure 13.2: Sky Flowers, “Petru Rareș” National College, Suceava, Romania.

In all these educational experiences, exploration of the unknown is necessary, therefore students and teachers have to use their intuition and imagination. The outcome of this is that they feel the transformative power of this journey. Dead letters from old textbooks melt as the adventure of playing with possibilities unfolds. They all realize that the secrets of nature can give wings to both learners and educators. Beyond words and what can be measured, there is meaningful change, humility, pure joy and a sense of wonder.

13.3 Involving the Community

The adventure continued. A new project was written so that we could build in our garden new facilities for experiments, project-based learning, play and artistic activities. Highschool students worked with their teachers of physics to arrange the energetic educational area. This has been designed for both curricular and extra-curricular activities so as to help increase the students’ awareness of the power of electricity as well as the limits of its production, in particular of the difficulties related to generating green energy.

Interestingly, this was a moment when we felt contented with what had been achieved, yet we were aware that there was a higher dimension that we needed to really be at the heart of our work and consider it our winged gift to all the generations of students and teachers that will spend decisive moments of their lives in this school. When I needed it most, guidance was present. During the ATLAS conference in Cluj, in June 2018, I encountered Dr. Lily Yeh and I learnt about her methodology and amazing projects [4]. I decided to organize similar workshops in our college with the aim of creating a mural painting in the school garden. The students loved the idea and enthusiastically participated. In groups of five, they explored their thoughts and emotions and imagined different possibilities of representation for the stories that are important for our community. For a few days, it was as if we were beyond time and space, as we were selfless, simply happy to create together, for the first

time a real team. Making mistakes didn't bring sorrow or any kind of discomfort. On the contrary, we celebrated every opportunity to discover new facets of ourselves and thus to playfully jump into the unknown and make everything brighter.

For me, personally, it was a wonderful chance to see everything I learnt about transdisciplinarity in beautiful colours. Our mural painting has come into being as a portal revealing that there is no limit for love and creativity. Children represented themselves as the Sky Flowers, joyfully embracing the highest reality of the Sun. These flowers gradually grow wings and become white birds that fly towards the Sun. There are also little houses with hearts at the windows symbolising children's love for all Creation, their faith that people can be kind and generous, so gentle in their souls that they can perceive the mystery and beauty of existence.

Every hour of painting was accompanied by music and story telling. From Lily Yeh's story to ancient legends and poems by William Blake, Emily Dickinson, Seamus Heaney and Fyodor Dostoyevsky, a whole world unfolded before our eyes and became our family. We reflected together on the highest meaning of this creation and we have understood that art which is inspired by devotion, courage, hard work and enthusiasm represents an immense force that can transform entire communities.

13.4 Conclusion

Confronted with the obstacle of artificiality which threatens to diminish human essence, to distance young people from their dream, educators must search for new forms of creativity and embrace the world with imagination. One has to remember that we can be like the legendary monk that inspired Andrei Tarkovsky's *Sacrifice*. This humble man, "bucket by bucket, step by step, carried water for the dry tree, believing implicitly that this was necessary, and never for an instant wavering in his belief in the miraculous power of his faith in God. He lived to see the Miracle: one morning the tree burst into life, its branches covered with young leaves. And that miracle is surely no more than the truth" [5].

Following Seamus Heaney's poetic thoughts inspired by the story of St. Kevin who stretched his arm out of his cell, turned his palm, and waited lovingly for the black bird to nest, "finding himself linked into the networks of eternal life", until "the young are hatched and fledged and flown", I see with clarity that the a teacher's existence is a gift of love. While making steps of wonder together with our students, beyond fragments of knowledge, struggling to achieve wisdom, we keep in mind the poet's message :

"Imagine being Kevin. Which is he?
Self-forgetful or in agony all the time
From the neck on out down through his hurting forearms?
Are his fingers sleeping? Does he still feel his knees?
Or has the shut-eyed blank of underearth
Crept up through him? Is there distance in his head?
'To labour and not to seek reward,' he prays,
A prayer his body makes entirely
For he has forgotten self, forgotten bird
And on the riverbank forgotten the river's name." [6]

In truth, the story we wrote through our school garden project absorbs and is absorbed in the wonder of these true accounts revealing the splendor of the heart in harmony with the mind. Generating transformation in our own hearts we see that we are not alone in our journey. Gradually, teachers and students become aware of the power of meaningful encounters with nature, with themselves and the others. They can gratefully smile looking at the world in wonder, sharing the conviction that a new Renaissance is possible [7]. In this manner, they realize challenges are in fact opportunities for fruitful change and joyful cooperation to bring their contribution to the permanent work of seeking wisdom so as to create new spaces of possibility for a better future.

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CHAPTER 14

Spirituality Contributes to the Success of Being Transdisciplinary in Social Engagement

Ven. Zizhuo Shi, Luminary Research Institute, Gaya Foundation (Taiwan).

This chapter explicates the significant role of spirituality plays in our project of transdisciplinary collaboration. The project is named Empowering the rural and the poor, and the term “spirituality” in this paper refers to the good quality of human beings, such as compassion, kindness, empathy, caring, non-Ego centered, acceptance, and persistence and so on. The method used is action/participatory research which means the researcher also participating in the project studied. Hence, it is a first-handed report rather than a theoretical paper. Our project was inspired by 2014 ATLAS Symposium held in Taiwan. This paper will illustrate the factors which transform a rural school, Meihua Elementary School (Figure 14.1), are not merely the artist works, but also the significant factors of spiritual practice involved.

Keywords: Framework for transdisciplinary problem solving, complex issues, consciousness, inner transcendence.

14.1 Introduction

This chapter presents a transdisciplinary project which is successfully carried out at Meihua Elementary School and its Community by Luminary Research Institute, Gaya Foundation (hereafter LRI). The project is named Empowering the rural and the poor, which aims to transform the youths and improve the living quality of Meihua community. The project of transdisciplinary collaboration originated from 2014 ATLAS 3T Symposium (Figure 14.2) at the National Central University of Taiwan co-held by ATLAS and Luminary Research Institute. After the symposium, a Memorandum of Understanding (MOU) was signed by representatives from five institutes, ATLAS, LRI, Barefoot Artistis Co., Servicespaces.com, and Meiqin Foundation (Figure 14.3). We agreed to work together to tackle some arising social problems in Taiwan, such as the digital divide, the gap between the rural poor and wealthy urbanites, the education of newly immigrant generation, and the like.

The first object chosen was a public elementary school named Meihua, located about one hour's drive from Taipei. The reason for choosing this school was that, at



Figure 14.1: Meihua Elementary School.



Figure 14.2: 2014 ATLAS 3T International Symposium in Taiwan.

that time, Meihua Elementary School was nearly closed down by Taiwanese government due to a decreasing number of students – less than the officially required 60. Moreover, the Meihua community had several social problems that were considered unsolvable by many locals, such as, most of the youths were moving out to work in the cities, leaving many houses empty and rice fields unfarmed. Furthermore, those youths who stay in the community lack confidence and feel no hope for the future. They become very moody and some feel frustrated to the extent of taking drugs. Another problem is new immigrant mothers from southeast Asia who are married to Taiwanese men. They could not speak Chinese and are not familiar with Taiwanese culture. As a result, they have difficulty communicating with their families and



Figure 14.3: LRI signed M.O.U. with five institutes.

neighbors. Both they and their children feel isolated. For all these reasons, Meihua Elementary School and its community are at risk of falling apart.

Our transdisciplinary collaborative project started from August 2014 until now. Three representatives from different institutes are positively involved, Dr. Raymond Yeh from ATLAS, professor Lily Yeh from Barefood artists Co., and Dr. Ven. Zishuo Shi from L.R.I. Dr. Yeh introduced many friends and provided part of scholarship for Meihua students and suggested us to carry out a program of recitation of Chinese Classics. Lily is our supervisor of art program. Ven. Zishuo is the project Group Executive Officer (G.E.O.) who designs the curriculum for art classes, planning activities for annual public artwork creation as well as leading local artists, teachers, students, and volunteers to carry out the whole transdisciplinary project.

The project includes three stages, and the final goal is to empower the youths and the community residents to transform their education and improve their living qualities. In order to fulfill this project, four programs have been planned: artwork program, mindful tutoring program, program for improving students' academic study, and program to empower community people to transform Meihua into an educational park for learning history, culture, art and natural environment. The stage one was focus on transforming the school, particularly, the negative mindsets of teachers, students and community people towards Meihua. This was done by means of the art program entitled Nurturing students potentials through art classes and public artworks creation, Stage two concentrates on improving students' academic achievement, and social interaction by means of mindful tutoring, reciting Chinese Classics and computer coding. Stage Three, empowering local people to transform their community by developing its unique feature of Meihua based on its history, culture and artworks and natural environments.

The results of four years hard works are encouraging. The government no longer mentions to close down the school because it outstanding perform in teaching and students' test. The school has received three awards from the government for its excellence in teaching innovation for three successive years, i.e. from 2015, 2016 and 2017. Also, students official test were improved—among 170 elementary schools, it was ranked as top ten for Chinese and Math (grade 3, and grade 5) and English (for

grade 5). Furthermore, people from locals and other places become interested in the artworks done by our transdisciplinary project. In addition, one of our local collaborative group, Jinan University has gained an award when they presented our project in a competition named Tic 100 Competition for Entrepreneurship Innovation.

This paper is not a theoretical argument but rather a first-hand observation report. The method used in this paper is an action/participatory research by which a researcher has to participate the project and keeps a record of the projects' activities and findings. I am a researcher from LRI and serves as the Group Executive officer (G.E.O.) of the empowering project. The paper is a presentation of our transdisciplinary team work with a focus on the spiritual factors which contribute to the success of transdisciplinarily collaborative project.

14.2 The Guiding Philosophy

The guiding philosophy of our transdisciplinary project is Nāgārjuna's philosophy of dependent co-arising (or dependent origination, *pratītya samutpāda*).¹ The philosophy states that every activity of human life, including both mental and physical activities, results from many factors, and these factors are interconnected and interdependent. Nāgārjuna is great Buddhist philosopher and practitioner whose philosophy has deeply influenced many Asian countries, such as China, India, Japan, Korea and so on. He lays out the philosophy of dependent co-arising in his masterpiece, *Mūlamadhyamakakārikā* (MKK) by saying that the nature, structure, and constitution of human existence are all interrelated and interconnected. Nāgārjuna describes human life and existential activity as a process of merging experience of things that we normally perceive. The core tenet of this philosophy articulates the interdependent nature and interconnection of an individual and other people and socio-political activities. According to the philosophy, no entity, including both animate and inanimate things, can exist isolated from other conditions—whether the conditions are material or mental—because of the absence of *svabhava* (self-nature, or own-being).

The fact is that no person, thing, activity, and so on, comes into being through a single or a fixed entity. Rather, the emergence of a life, an event, et cetera, is through a process of becoming; and, in the process of becoming, many factors come to assist. Hence, the existence and emergence of an entity is dependent on and conditioned by many supplementary factors. In MKK, Nāgārjuna discusses this theory by investigating two questions related to the concept of motion: What is the locus of motion (i.e., where is the motion taking place)?; and, What is the object of

¹According to Andrew Tuck (1990), Nāgārjuna's philosophy has been compared to that of several western philosophers'. In brief, it consists of three phrases. The first phrase is the Kantian phrase, then is analytic phrase and third, a post-Wittgensteinian phrase. The first example is that Theodore Stcherbatsky interprets Nāgārjuna's philosophy as dividing the world into appearance and reality as Kant does in his Critique of Pure Reason. This view is further interpreted by T.R. V. Murti (1955) as the Absolute and the world of phenomena. In the second phrase, Richard Robinson's article "Some logic aspects of Nāgārjuna's system" (1957) analyzes and compares Nāgārjuna's dialectic argument (*catuskoti*, the four alternative positions of reasoning, or tetralemma) to the modern symbolic logic. The third phrase can be seen in Frederick Streng's Emptiness and Chris Gudmundsen's Wittgenstein and Buddhism. These two underscore the similarities between Nāgārjuna and the later philosophy of Wittgenstein.

motion (i.e., what is it that has the property of moving)? By asking these questions, Nāgārjuna shows that a motion and a mover are mutually dependent on and defined by each other. The motion is the property of the mover; whereas, the mover is the agent of the motion. A motion cannot be called a “motion” without the moving action of a mover. The mover, on the other hand, would not be called a “mover” if (s)he does not take the action of moving. Hence, they are mutually dependent upon and define each other. This interdependent nature of existence is called “dependent co-arising” or “dependent origination”.

According to Nāgārjuna, dependent co-arising does not merely occur in relation to an event or activity, but also in relation to an individual’s self-identity and construction of knowledge. He argues that every individual is constituted at least by five components: the physical body (*rūpa*), sensation (*vedanā*), perception (*viññāna*), intellect (*samskāra*) and consciousness (*viñjāna*). The individual self, Nāgārjuna suggests, cannot identify solely with one of the five components, such as the body or consciousness; nor can it separate from them, or only contains part of them, or be part of the five components (Westerhoff 2009, 155), Human life is a process of emerging/becoming; and the sequential process involves both mental and physical activities. These activities are interdependent upon each other in order to constitute an individual’s life undergirded by the five components. Hence, even if an individual looks like an autonomous entity who is physically isolated from other human beings and from sociopolitical activity, by its very nature, it is in need of interacting with and influenced by these factors.

To further illustrate the interdependent relation between self and other factors, Nāgārjuna discusses the nature of epistemology and knowledge in MKK. According to Jan Westerhoff (2009), the significance for Nāgārjuna in discussing the theory of knowledge is that “objects of knowledge and means of accessing them form an essential part of our conceptualization of the world and our place in it” (155). Westerhoff explains that “objects of knowledge” indicate objects which are perceived, and “means of knowledge” indicate perception, inference, recognition of likeness, and testimony. Thus, means of knowledge is the instrument that an individual uses to understand objects of knowledge, which connect one’s inner world with the world outside her/him. Nāgārjuna’s investigation starts from the assumption that both the perceived objects and the means of knowledge possess independent self-natures or own-being, i.e., *svabhāva*. Yet, through his investigation, he found that no independent perceptions (or “means of knowledge”) can perceive an object without its referent, nor any independent, perceivable substance that, by itself, can give people knowledge without the help of perception and other means of knowledge, such as inference, and recognition of likeness. The means of knowledge and the objects perceived have to work together to make knowledge possible: without means of access, objects cannot be recognized; and without perceivable objects, the means of access cannot produce knowledge. Thus, human personhood and other activity/existence are interdependent and mutually conditioned by each other.

It is in light of the philosophy of dependent co-arising, we realize that the world is characterized by interrelatedness and interconnection. The goodness of a socialty or the collective well-being of the world cannot be achieved if one only cares about his/her own wellings, but ignoring those who suffer from both financial and social disadvantage. Moreover, we believe the non-dual truth, that is, the being is not separated from the becoming. Hence, a transcendent being cannot be achieved without starting from the secular work. A peaceful society and world is not coming from a

sudden magic. Rather, it is coming a process of collective caring and works. Furthermore, the philosophy reminds us, a trans-disciplinary project although powerful and full of resources, it would be unable to achieve its goal without the involvement of both physical and spiritual factors (spirituality). It is based on these principles that we initiated our project with the support from Luminary Buddhist Society in Taiwan.

14.3 The Definition of Spirituality

The term “spirituality” in my paper is defined in light of Nāgārjuna’s philosophy of dependent co-arising. That is, as mentioned before “human personhood and other activity/existence are interdependent and mutually conditioned by each other” as well as “Human life is a process of emerging/becoming; and the sequential process involves both mental and physical activities.” Hence, although we accept the definition of spirituality of Oxford dictionary as “Relating to or affecting the human spirit or soul as opposed to material or physical things,” and “Relating to religion or religious belief,” our meaning of spirituality is closer to what Merriam-Wester Dictionary defines the word “spirit”:

1. an animating or vital principle held to give life to physical organisms
2. temper or disposition of mind or outlook especially when vigorous or animated in high spirits
3. the activating or essential principle influencing a person acted in a spirit of helpfulness
4. a special attitude or frame of mind
5. person having a character or disposition of a specified nature

In other words, spirituality in this paper refers to a kind of quality and attitude of mind, especially, good quality of human mind, such as compassion, mindfulness, caring, non-judgmental, open-minded and acceptance of diversity and the like. This is very similar to the nature of spiritual mind in Chinese or the nature of awakening mind or bodhi mind (great mind) in Buddhism.

The spiritual factors contribute to the success of our Empowering project of trans-disciplinary collaboration.

In the following, I will explain the way in which spirituality contributes to the success of our transdisciplinary collaborative project by some examples.

14.4 Art Program

The first set of spiritual factors with regard to our transdisciplinary project are compassion, kindness, caring for the poor and persistence. This empowering project is entirely originated from collaborative members’ compassion, kindness and caring for the rural and the poor. Neither financial support nor any resource are given by the government or Meihua community and school. The resources used most provided by LBIS, whose research institute is LRI, and part of the scholarship is from Dr. Yeh’s family. Barefoot artist also was invited by LRI and came to create artwork as a volunteer. Apart from the absence of resources, there are also challenges and hardship in the process of carrying out the project. The conquer of these challenges



Figure 14.4: Meihua elementary school's art class.



Figure 14.5: Painting Meihua community and telling story of Daxi.

and hardships is based on the vision of our guiding philosophy and the persistence of our team members.

The art program carried out at Meihua school includes two parts: one is a weekly art class (Figure 14.4). Another is an annual creation of a public artwork. The art class focused on a two-hour art class each week for grades one to six and the annual creation of a large public artwork. In the art classes, we provided a theme for students' weekly artwork. We taught them various artistic skills and chose themes related to their lives and community, to build their confidence, communication skill, observation capacity and other potentials. For instance, there were classes on painting Meihua and telling the story of Daxi (Figure 14.5 and Figure 14.6), their local district. The purpose was to transform the negative image they had of their community and replace it with a sense of confidence, honor, and community identity.

Students were asked to draw a picture that showed their lives in Meihua. While students were drawing, or having a hard time drawing, LRI's volunteers encourage them and facilitated as they described their lives in pictures. We skillfully reminded



Figure 14.6: Painting Meihua community and telling story of Daxi.



Figure 14.7: The creation of three public artworks.

them that nothing is too small or too bad to draw. Everything they felt was important or impressive was valuable. Many touching stories of students' daily life in their family and community emerged, vividly portrayed in the students' paintings. Their paintings and stories gave us a chance to know more about the students, their families, and the Meihua community and the students started to open their hearts to us, helping build relationships of trust between the students and us.

Another activity for the art program is the annual creation of a public artworks. The creation of public artworks is supervised by barefoot artist Lily Yeh with the collaboration of LRI and Meihau school. Sometimes, LRI's volunteers and community volunteers also come to help. So far, four huge artworks have been created – a three-story-tall mural with a tree of life full of spinning tops and flowers, a large gyro (236 cm tall and 628 cm round), a sky-like ground work decorated with four huge colourful animals symbolizing the guardians of the universe, and campus painting (Figure 14.7).

Usually, Ven. Zizhuo would discuss the topic of public artwork in the beginning



Figure 14.8: Preparation of mural creation.

of autumn semester with artist Lily, then design a curriculum for the art class. The teacher of art class would lead students to draw or do artwork according to the curriculum. Then, students' artworks would email to artist Lily, and she would design the public artwork based on students' artworks selected.² Each public artwork would take a semester to prepare and ten or fifteen intensive days to complete. Ven. Zizhuo would do the preparation, and Lily would come to supervise the artwork creation in April for ten or fifteen days. The artwork incorporated the valuable cultural heritage of the Meihua community and the school. Historically, the Meihua community was one of the earliest sites of development in Taiwan and many stories about the natural environment are an integral part of its history.

Many teachers and volunteers from the community are invited to participate in these art projects, and while creating them, although many wonderful stories emerge, some challenges and difficulties also occurred. In particular, for the first artwork of life tree mural. Since its tall is 22 meters (Figure 14.8), the principal of Meihua was stunned when he saw the design. Moreover, most of the school teachers also considered that we were too ambitious and nearly crazy to design such a huge work (Figure 14.9). Never before in the school's history, such large artwork has been done. Hence, the principal asked artist Lily if the work could be reduced to half. Lily's answer was "no" and said that if the art work was reduced to half, she preferred not coming to create it because the effect of the mural would greatly be lost. Being the G.E.O. of the project, Ven. Zizhuo decided to persuade the principal to carry out Lily's design. Principal although agreed, he explicated that school did not have money or any resource to create the artwork. Hence, Ven. Zizhuo needed to find resources and volunteers for the artwork creation. Yet, when the project started to paint the foundational color of the wall, neither principal nor a teacher joined the work. Only a couple of LRI's volunteers and Ven. Zizhuo did the hard work for a cold and raining week. It was not until two thirds of the wall had been painted, Ven. Zizhuo skillfully convinced the principal by saying that it would be a historically significant

²The only artwork whose painting is not based on students' drawings is the universal spinning top. Yet, it is created by Lily Yeh, LRI, Teachers, students and xiangguang's volunteers.



Figure 14.9: The artwork is 22 meters.



Figure 14.10: Meihua's Mural of life tree.

for him to join the painting work. Later, because the need of more teachers to take care of students who come to paint the wall in art class as well as the coming of artist Lily, principal and teachers were accepted LRI's invitation came to create the artwork with LRI and LBIS's volunteers. Some students from a local high school named Zhishan also accepted our invitation and came to join the work.

Meihua's mural of life tree (Figure 14.10) was completed on March 26, 2015, and exhibitions were held. All the local officers, students' parents, family numbers, friends, and the local media are invited to attend. Everyone involved in these meaningful artwork creation – especially school teachers, students, volunteers, parents, and the artist – felt moved and inspired. In the process of creating art and telling their stories, the teachers, students, and people in the community who are involved gradually change their view of Meihua and a new and positive image of Meihua community is generated. Many students' hearts, which may have been hurt before, become healed. In particular, the principal and teachers began to believe the moto told by LRI: only with thinking, work cannot be done, whereas with working, work can be done even better than thinking.



Figure 14.11: LBIS's volunteers.



Figure 14.12: LBIS's volunteers.

It is because seeing the large mural was created successfully and on time, principal's and teachers' attitude entirely transformed. This transformation, in turn, led them willing to take upon competitions and receipted awards.

From the above story, it is clear that some key components of spirituality were involved, such as the compassionate caring about the poor school, from barefoot artist Lily, Dr. Yeh, and Ven. Zizhuo. Moreover, the persistence and patient negotiation of G.E.O. and volunteers' (Figures 14.11 and 14.12) kindness also played an very important role for the creation of artwork. Without these components, the artwork might unable to be created because of the absence of resources and the fear of performing unprecedented difficult task.



Figure 14.13: Mindful tutoring program.

14.5 Mindful Tutoring Program

The second set of spiritual factors contribute to the success of our collaborative project are the mindful acceptance of differences (figure 14.13 and 14.14). These spiritual factors are seen in the mindfully tutoring program carried out by LRI and LBIS's volunteers. The classes included mindfulness meditation, academic tutoring, problem solving, and compassion practice. Classes are held every Thursday afternoon for students in grades one to four and every Friday afternoon for grades five and six. At the beginning of class, we practise a mindful meditation game, such as mindful listening, mindful breathing, mindful eating, or mindful walking for five to seven minutes. Then, we help students with their homework and let them ask questions if they like. Before the end of class, we practise compassion meditation by inviting students to express their gratitude toward teachers, family members, friends, volunteers, and others, as they wish. The practice of meditation on compassion helps transform the tension between teachers and students, and improves students' attitudes toward school and teachers. Most teachers are under pressure to follow a strict curriculum and without enough time to attend to those students who have not yet keeping up. Sometimes, teachers may become impatient with students who are slow learners, or some teachers may perceive these students to be problematic or misunderstand them as mental disable. In response, these students may become rebellious. After our tutoring classes, many teachers say that students become more polite and respectful towards teachers and classmates. The mindful tutoring class facilitates volunteer-teacher relationships and helps identify some of the students' problems, which may be difficult for teachers to solve. These problems include ADHD, anti-social and violent behavior, and special needs, such as intellectual deficiencies. Our findings show that these problems may be caused by insufficient cultural stimulation in the family, especially families with immigrant mothers or single parents. Teachers who use this new approach with their students find that learning abilities improve.

Three cases of students can be illustrated three spiritual factors involved in helping teachers and students: non-judgmental attitude, mindful observation, and acceptance of difference and diversity. When we started the tutoring class, some teachers told us that there were some problematic students who were either identified as a violent student, or ADHD or learning disability. They said that because the school did



Figure 14.14: Mindful tutoring program.

not have psychological consultant who could help those students, and two students with learning disability were almost abandoned. Yet, when we mindfully observed these students without assuming that they were problematic, we saw those students differently. For those two were identified intellectual deficiencies, through tutoring, we found that they both were born by a newly immigrant mother. This implied that their mothers might be unable to speak Chinese fluently. Accordingly, the students were slow in their studies and could not catch the learning pace of their classmates. This finding led us to separating them from their classmates and designing an individual tutoring class based on their learning capacity. The effect was noticeable and these two students' studies improved greatly. One of them after two years tutoring became top two students in his class.

Another case was a violent grade 3 students who always challenged grade 5 students to flight with him. Some teachers thought that his violent personality was inherited from his family because his father sometimes abused his mother. Yet, we did not pay too much attention to this remark but rather with an open-mind, we mindfully tutored him with non-judgmental thought. Once he seemed very upset, and we decided to chatted with him about his family. Through this chatting, his violent problem came to light. The fact was that he was the youngest children in the family. A sister was in grader 5 and a brother just attended junior high school. Since his father's abusive behavior, his mother left family and lived in another place. Hence, his grandmother was the one in charge of the family chores. Sometimes, she would ask him to cook or throw the garbage when his brother and sister were unwilling to do those chores. Because he was a very thoughtful kid, he would do what his grandmother asked, but he felt bening treated unfairly. Since he could not win the argument with his brother and sister, he became using fist to challenge them. Another factor resulted in his violent was because he felt no one paying attention to him and understanding him, especially when he missed his mother and wanted to talk with his family members. We listened to him with care and empathy. Meanwhile, we praised him as a good kid for his thoughtfulness and willing to help his grandmother.

Also, we told him that we were very happy to hear what he wanted to say about his mother. Ever since the chat, the student was like a reborn kid always smiling when we met. Furthermore, he became like to help other classmates with work and studies. No complaint of his violent behaviour was mentioned or seen by teachers. Hence, we found that a non-judgmental attitude with a mindful and empathic acceptance helped our tutoring work greatly. It was also because these spiritual factors, students loved to come to tutoring class because they could study both happily and effectively.

The last but not least set of spiritual factors significant to collaborative project are non-Ego centred, humble and letting-go attitude. This is particular true when the project becomes famous or certain benefits are involved. Many people would like to join the projects when they are unable to find resources and financial support. Yet, when the project is successful and becomes famous, some partners may prefer to work on their project rather than caring about the collaborative work or sharing resources with other partners who are still on the process of struggling. Some partner may starts to declaim that the collaborative project is his/her project and forgets the contributions done by other partners. These are all possible situations. If these things occur, and communication is impossible, in view of long term project, it is better to let go argument and moves on to find other partner who is willing to join the project. On the other hand, if we are one of the collaborative team members, we need to remind ourselves to be humble and non-Ego centred. Otherwise, we may become the destroyer of the collaborative team unconsciously. Saying is much easy than doing when this situation comes. Hence, the spiritual factors of letting go, humble and non-Ego centred are also core elements contributing to the success of a collaborative project. Many more spiritual factors can be identified in our project. Yet, due to the limit of length of this paper. I will leave them to other paper.

14.6 Conclusion

Through being the G.E.O. of our Empowering the rural and the poor project of transdisciplinary collaboration. I found that the transdisciplinary collaboration is a very powerful way to carry out a project. Yet, the success of a trans-disciplinary project (Figure 14.15) requires not only many professional experts and professors, but more importantly, is the element of spirituality, including compassion, social concern, persistence, caring, tolerance, non-judgmental attitude and non-ego centred mind and so on, to ensure the project would be carried out without any obstacle.

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Figure 14.15: Awards for Meihua's Excellence in teaching innovation.



Figure 14.16: Awards for Meihua's Excellence in teaching innovation.

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CHAPTER 15

The Transcultural Perspective and the Smart Education

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The spectacular evolution of technology in the last decades would not have been possible without the integration of information in the function of products. This has been achieved through the mechatronics that offers a successful model of integrating matter, energy and information. By researching the products it created we were able to draw some important conclusions that allowed a better understanding of man and led to adopting a realistic, integrative and transcultural perspective. It allows the creation of a smart education in complete agreement with the profound nature of man and the learning processes. Starting from it, smart teams, organizations, communities and nations can be built that are aware of themselves and masters of their own development. Inside them the quality of participation, of integration and of things accomplished together grows more and faster than in ordinary conditions, which increases the satisfaction and the concrete gaining.

Keywords: System thinking, smart system, self-determination theory, transcultural perspective, smart education, competence, spirituality role, mechatronics era.

15.1 Introduction

The technology has evolved so much in the last decades that now it is under discussion the creation of smart cities. The smart products, especially phones are very accessible and therefore widely spread. The impact of their use is still little evaluated and it is relatively difficult to anticipate the effects on the users, on knowing man and society.

Unfortunately, evolution of discovering man, and the support he gets through education to achieve a fulfilled life is small, tributary to an old perspective on the world. The same thing happens at the level of teams and organizations. Man and the systems that integrate him cannot evolve consciously, efficiently and sustainably in the current approach. To manage the participation a new approach is needed, one that integrates not just the practice developed in technologies but also the most recent information on man.

After some profound transdisciplinary research on the innovative potential of

mechatronics in developing a smart education centered on competence, possible developments have been identified, with major implications in this field [1]. Some of the discovered results are succinctly presented in this paper. Analyzing the mechatronics, the smart products, using a systemic thinking, paying great attention to the design, the control and the integration of the smart systems, surprising things have been discovered that greatly help to better understand the man and the supra-individual systems he participates in.

A new perspective has been identified which helps man come out of the limitations and the control that the culture has over him, that can insure the collaboration and an authentic integration in more and more complex and bigger over-individual systems, beyond the cultures built inside them. Staring from this perspective and in accordance with it, from the new understanding of human nature seen as a smart system, a new approach on education appeared called the smart education.

It respects the integrity of the systems and suggests taking over the control from the inside, just like the smart objects can get. The main instrument at the foundation of the control is the software whose main components have been identified. Improving from the inside the mental software (procedural etc) used by the person, team, organization, community or nation it can consciously evolve to ensure a better management of the system it forms, according to its fundamental needs, and a quality participation in the integrative systems.

15.2 The Functioning of the Smart Systems – Short Presentation

The theory of the systems takes into consideration the systems in general but it is less interested in the smart systems, capable of growing in time, and have a participation in accordance to the tasks given or assumed, taking into consideration what is happening around them. The humanities and social sciences have studied the man, but not from a perspective from which he is seen as an intelligent system, well integrated. It is because of this that the man is seen incomplete and incapable of describing in a satisfying way his extraordinary complexity, the learning etc.

A much better analysis of the smart systems is possible now, in the technological era we live in, an era of mechatronics and of smart products. This allows us to see how exactly the systems that are capable of evaluating information, of driving themselves, of learning, of participating and forming very complex systems together - systems of planetary dimensions like the GPS or the internet – work.

The facility added to the products that determined the evolution to a mechatronics system is the self control. To achieve it, it was necessary to integrate microprocessors in products and to develop the software that they execute. Therefore at the basis of the smart devices function, there are microprocessors capable of executing instructions (the hardware component) and complex programs created from instructions (the software component).

The smart products' activity is controlled through the software they execute. This is a new element that allows us to better understand a new dimension of information, the one that determines the way in which the actions take place. All the system's components are integrated at the software's level, so the demands of the users can be met taking into consideration the internal and external conditions. The basic elements that ensure the function of the smart systems are a platform of

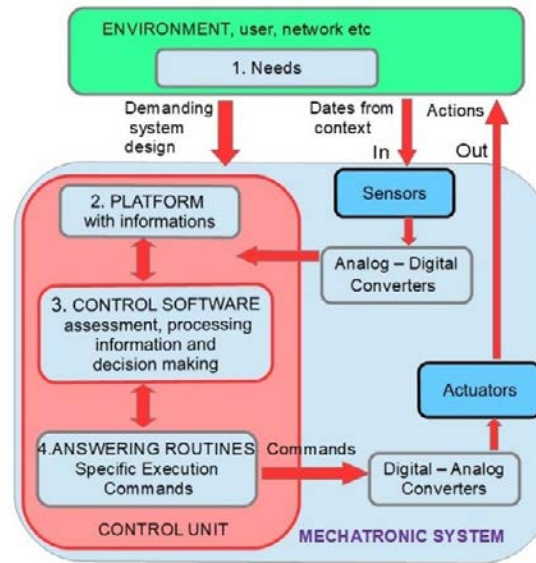


Figure 15.1: The main components of a mechatronic system.

information, a system that makes decisions and takes into account the information received from different pathways and the roots of accomplishing the necessary tasks. These elements cannot be understood without the fourth integrated element that gives meaning to the other three, the need the machines answers to - Figure 15.1. [11]

Nowadays a product can meet many needs, and that is why the means of acquiring data, the decision making programs and the execution routines can be very complex. For example, a Smartphone is no longer a simple phone, but a small computer with many integrated additional functions, from state-of-the-art cameras to internet surfing and travelling with a GPS. Another example, the automatic pilot of a plane is the result of the integrated function of a net of mechatronics devices. They can process data from hundred of thousand of sensors, can make decisions in complex situations and can ensure the safe flight on the most optimized route from one airport to the other.

Until the emergence of the smart products, capable of running programs, the information known to man was *about* how the things worked. With the software, the information is retrieved, processed and well integrated so it *determines* how things evolve, taking into consideration both the purpose followed through the internal programming as well as the environment information.

15.3 The Programming of Man

Both smart and living systems integrate all three major components of reality: matter, energy and information. Inside the living systems, through the genetic code both the growth of the organism, its reproduction, its development and the management

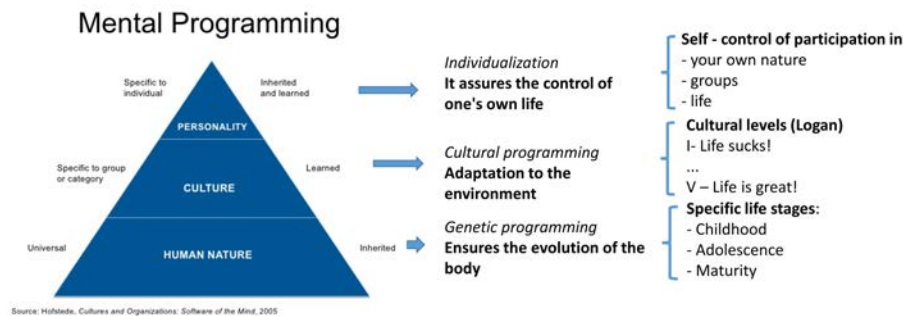


Figure 15.2: Types of mental programming.

of the current activity are ensured. They must collaborate, answer in a specific and constructive way to the environment conditions to ensure a stable balance and a concrete evolution towards a good management and integration of the system.

Because of these reasons, programming the living systems is much more complex than programming the smart machines. Hofstede, Hofstede, Minkov [2] suggest three levels of mental programming, one given by the human nature, one by the culture surrounding the person and a personal one. For these three levels of personal programming acknowledged, there are three levels of programming: genetic, cultural and self programming – Figure 15.2.

The control can appear in one of the types identified, and it can be achieved totally and ideally only if it is integrated in the personal level. If it is situated at the cultural level, the person is not truly free; they just try and use the software of their own culture that they can complete with some from other cultures. The collaboration of this person with other people from other cultures is very difficult. To manage a good programming of life from a personal level, humanity has spirituality. Its purpose in the world is that of helping man to successfully integrate and manage the other two more profound levels of programming, so he can say in the end, without reservation that life is beautiful.

The personal programming is a successful one if the person manages both a good maturity and also to achieve the cultural level 5, on which life is beautiful, thus integrating the two levels of programming. The skills, the abilities that man uses to execute most of the tasks are also developed as mental programs, through which different instruments acquired from culture are managed. With the help of some common approaches people can easier achieve things together.

For example, an important instrument developed by societies inside their cultures, is the legislative framework that regulates the road traffic. It presents the regulations that ensure a safe management of the public roads. But the fact that it exists is not enough. The people must respect it, so they must develop the necessary skills to travel correctly, whether as a pedestrian, bicyclist or driver. To do this, people must develop the mental software that allows the handling of their behavior according to the purpose and the rules they must respect. On one hand the driver must be able to drive the vehicle and on the other he must fully respect the law to prevent accidents and injuries to others.

Programming must not be understood as rigid, man can always intervene in the

development of an action, but within his own limits. Duhigg[3], Coyle [4], present the way in which learning is evolving, both as an individual and as a team, also mentioning a part of the physical support. Gallwey [5] describes the inner game that leads to achieving the performance, based on the fact that the background activity for the proper development of things takes place mainly in the subconscious.

15.4 Competence – the Need to Have Quality Participation

Two very important things are nominated through competence, the first is connected to the tasks inside a system, the second shows the level, the quality of accomplishing the tasks. Thus, the competence means a quality participation, both through that with which the system is aiming for, as well as through what the participant offers, Vlaşin [6].

To establish the source of the competence more clearly, we will analyze the dynamic integration, the evolution of a person in an integrative system. In Figure 15.3, Gharajedaghi [7] presents the iterative way in which a system can be researched and can evolve. Upon a quick look, we can observe the correspondence of the three basic components of the system at the level of the psychic in the basic psychological needs -Ryan, Deci [8]. Thus, the functions assumed by a system inside an integrative system are connected to its need of relatedness, the structure of the system demands autonomy to be secured and developed, while successfully managing the processes is connected to competence.

The basic psychological needs ensure both a proper integration of the system in other systems as well as its good development in the science of executing the processes, in complexity and in structure. For these reasons, they ensure the foundation of our motivation. The competence is also a need, and we are rewarded with an inner satisfaction when we manage to succeed in certain things. The authentic joy of a person comes from satisfying the basic psychological needs. This is why they must always be taken into account outside the ordinary behavior and interests.

From a systemic perspective, the best characterization of a man is that he is a participant. He is part of a great number of systems, from family, community, nation, to very general and complex, as is the phenomenon of life. The quality of the participation is determined first of all by the competence connected to the processes' control and by solving certain tasks in the systems in which he is integrated. Through the effort of improving the quality of his participation he can gradually and interactively evolve to a state of higher satisfaction.

The increase of the competence, the improvement of the participation can be achieved in two ways: learning from experience and learning from others. The latter saves more time and effort. This is why the cultures exist and the cultural programming appears when a person is taught by parents and by school which are the necessary elements to survive and to pursue a profession. But this powerful programming is very difficult to counter or to integrate through personal programming, to insure a detachment of the person and a real, responsible competence. This is how a person becomes controlled by the impersonal "it" (it is how it is done, believed, thought), as Heidegger observes, which leads to an unauthentic life [9].

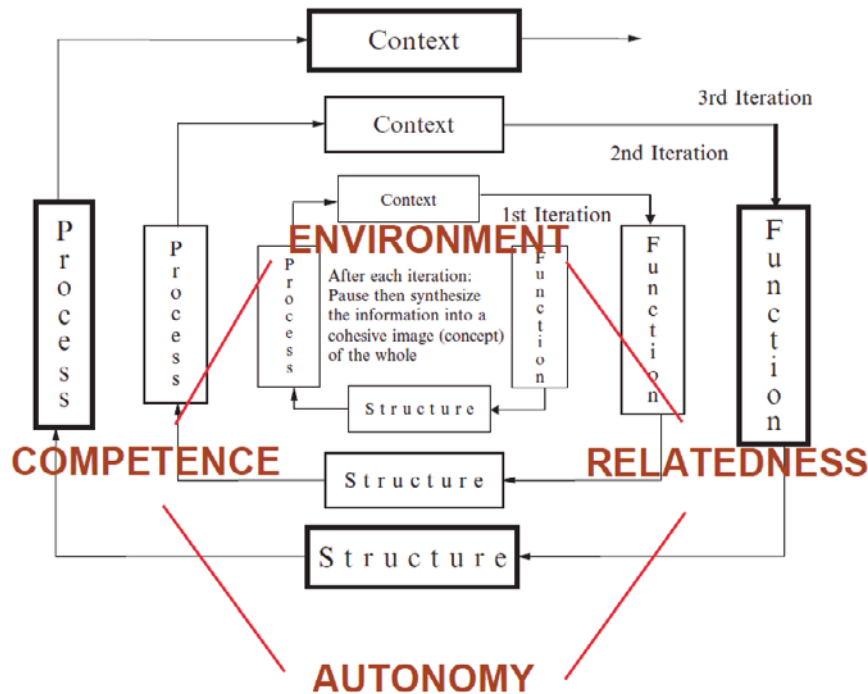


Figure 15.3: The iterative development of a system and the basic psychological needs.

15.5 The Transcultural Perspective

The cultural perspective can be observed the easiest. Inside a culture we also learn the language it is based on, and thus we can observe the differences and the formative importance of a culture especially when we hit the linguistic barrier, or we do not understand the customs when we go across cultures. The specialists say that the impact of this crossing can be felt quite strongly, Hofstede [2]. To ensure an authentic life and a real collaboration it is necessary to consciously be reported to the cultural programming. It requires adopting a new perspective that we called the transcultural perspective. Inside this perspective, the purpose of the culture in offering the instruments that people learn from one another is acknowledged. By learning to use them, people upload mental software and people can become aware of them if they analyze their purpose and relevance in satisfying the basic psychological needs.

From a transcultural perspective, a person can easily observe that people who grow up in different cultures can use different instruments to satisfy the same needs. The manner to satisfy a need or to accomplish certain things is no longer as uniquely determined and imperative as it is through cultural perspective. Going beyond the available means and observing the purpose of the actions through the perspective of the need was proposed and verified in solving conflicts by Marshall Rosenberg [10], in an approach called Nonviolent Communication.

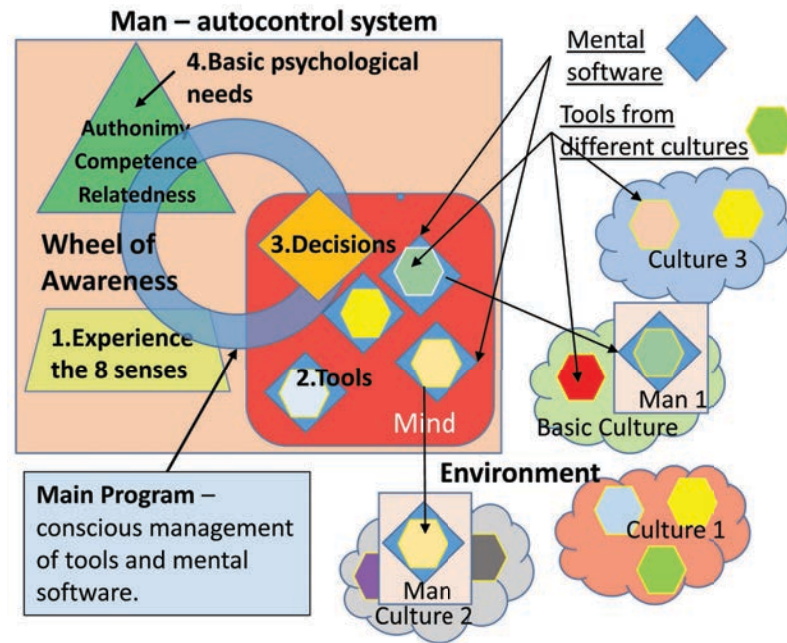


Figure 15.4: The completion of the main program of personal programming.

To manage his position in a transcultural perspective man must consciously evaluate the mental software he uses, identifying the four elements analogical to the software of the smart machines. This type of main program, through which the personal programming could take over the control by becoming aware is presented in Figure 15.4, Vlašin, [1].

We can observe that the main program can travel both ways through its four components to offer an integrated and efficient approach of the action, in respect to the needs. The living experience is evaluated through the 8 senses presented in the wheel of knowledge proposed by Daniel Siegel [11]. What's more, we consider that the information from the experience can be structured, so we have representations of the experience like "his attitude is a flexible one" even though none of the words have a physical consistence, which can be perceived with the senses.

Taking into consideration the complexity of the culture, the multitude of disciplines, their long evolution, the culture programming is very strong. To insure the balance and to support the development of the personal programming, spirituality has developed inside the humanity. It offers man ways to become detached from the cultural programs and from those that limits him, such as the ego or the protector, mentioned by Yousry [12].

Studying the two great spiritualities, the western (the Christianity) and the oriental (the Buddhism) we can observe that the first clarifies the means through which one can most efficiently achieve the objective identified by the latter. Thus, the oriental spirituality tells us that for an authentic development of a person, for a suc-

cessful individualization beyond the cultural programming one needs: 1. achieving the mental vacuity, 2. achieving the clarity and 3. the love – Rinpoche, Swanson [13]. The mental vacuity implies a glance beyond the processes and the mental software, and awareness that goes past them, through the self as a pure observer. In the Christianity it is obtained by gazing from the perspective of death, from which all the plans, all the petty interests are reconsidered and the mind stops its tireless activity.

The clarity can be obtained through the word, which is quite obvious if we observe that nothing that is not named can be controlled or acknowledged. Its importance is underlined in the recent psychology by Feldman-Barret: “Everything you perceive around you is represented by concepts in your brain. [...] Without concepts, you’d experience a world of ever-fluctuating noise.” [14, p. 117]. The words, the concepts that we use are in direct connection with responsibility: “So the question of responsibility becomes, Are you responsible for your concepts?” [14, p. 195]

The love also has, like other concepts, many meanings. Many are connected to emotions, but spirituality looks beyond them. “Pure love can be best described as a fundamental state of good that, if well nourished, can transform in kinship with all the living things.” [13, p. 88] The proof of love is the quality participation to integrative systems. In western terms, love means serving the others, in integrative systems. The validity of this approach is confirmed by the theory of systems, in which the system is defined and evolves only as part of an integrative system, through assumed functions.

Feldman-Barret also observes that “The human brain is a cultural artifact. We don’t load culture into a virgin brain like software loading into a computer; rather, culture helps to wire the brain. Brains then become carriers of culture, helping to create and perpetuate it.” [14, p.184], hence the difficulty in adopting a transcultural perspective.

Alongside these difficulties determined by the unconscious formation caused by the adaptation to the cultural environment, the assimilation of the spirituality as part of the culture makes the individualization even more difficult. If the culture is the manifestation of the collective spirit, the spirituality arrives to save the person, and this is why both are necessary, complementary and works differently.

Regarding from a systemic point of view through culture ways of being, doing, tasks and instruments are presented to man to participate to integrative systems; through spirituality he builds the structures and the character capable to sustain these systems. The competence implies first of all the improvement of participation; this is why it depends on both and also influences them.

15.6 The Smart Education

It is obvious that the current education does not yet take into consideration the complexity of the systemic integration, much less of the smart ones. It is now more than anything else a system of transmitting the culture, in which the individualization, taking control of your own life, of its basis programs are neglected. Therefore there cannot be an authentic growth of the competence because the development of the person’s autonomy is neglected. Pupils are taught to execute orders, they go through imposed common programs, in the same rhythm, so the adults become

people without initiative, either docile or controlling bosses, as Deming says being quoted by Senge [15].

Moreover, another problem that the person must solve is the exploitation of the genetic programming, the management of its manifestation at the level of the man taken as a whole. The childhood, the teenage years and the maturity are manifestations of a person's evolution genetically determined, that expresses in specific ways that cannot be ignored. The basic psychological needs take effect beyond age because they are systemic characteristics. This is way the child seeks autonomy, starting with walking, language and continuing with other activities he sees the adults do. During the teenage years the development of the competence is intuitively sought and also the capacity of autonomous dealing with situations in a group.

The maturity is the period for integration, not only external but also internal of the experiences, in order to exploit them to reach a wonderful life. Regarding from the perspective of Logan, King, Fischer -Weight's cultural levels [16], we can observe a correspondence between childhood and the cultural level 3, teenage years and level 4, maturity and level 5. Of course we do not talk here just about the development of the physical organism and of physiology, but of the entire being, maturity being the stage of the fulfilled man. By reporting to the basic psychological needs, the stages of the genetically programmed development can be integrated.

This is why an education that takes into account the smart function of the human being, based of software specific to different levels of integration, must have as a basis a transcultural perspective. The learning process must be a complex one that takes into consideration all four elements of the software. These must be followed both inside the main program of individualization as well as in the case of the software used to manage the instruments, evaluate the experiences, the decisions etc.

The current education is mainly one that suggests the usage of different instruments, among which the knowledge, different algorithms to solve problems etc. It does not pay attention to the person's experience, from which the real grasp of reality is born, but imposes him to learn certain things. It does not respect his freedom; this is why other suggestions have appeared like the experiential learning – Kolb, [16] or the learning for freedom – Freire [17].

We call the education based on the discoveries connected to the functioning of the smart systems on understanding man, the cultural environment and spirituality from this transcultural perspective, "Smart Education". It integrates not only the current education but also the other types of educations / types of learning suggested by different authors, the experiential one and the one for freedom.

The integrated learning process from its basis completes the learning evolution proposed by Roger [18] with the needs, and closes it to transform it in a transcultural endeavor, which we can observe in Figure 15.5. One can go over it in two ways, one indicated by the big circle, of direct learning that starts from experience to meet the needs and the one in the middle is the way of the reverse connection, from the needs to selecting the attitudes, the instruments and the experiences that can determine a better meeting of the needs.

The child must be helped to develop as a smart being, by integrating the components necessary in increasing his capacity of managing all the necessary elements for a fulfilled life. This can be achieved even during the prenatal state when the environment in which the mother lives and her experiences influence the child. For a harmonious development during early childhood the ideal would be for the parents to adopt a transcultural perspective to ensure a cooperative environment based on

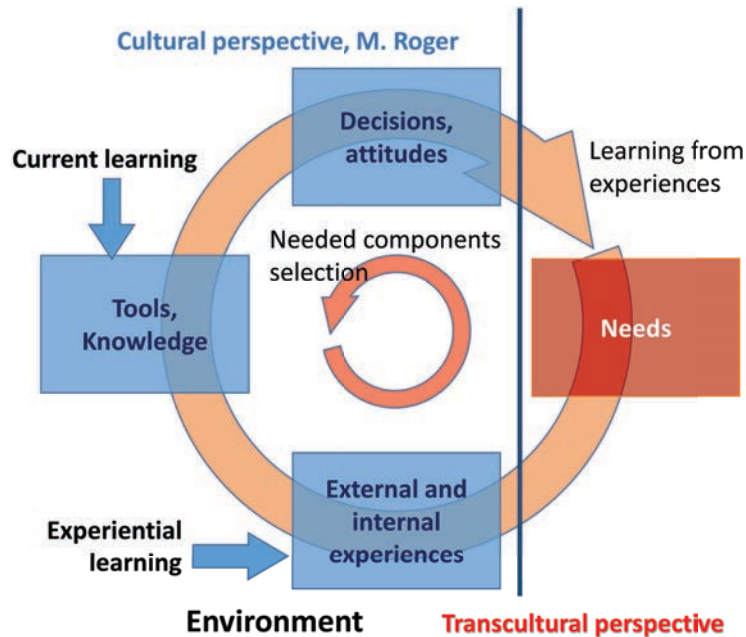


Figure 15.5: Complete learning cycles from transcultural perspective.

authentic and total respect.

Education is a process proposed by the society. But in order to be efficient and contribute efficiently to the development of autonomy it must be assumed by the person who is learning. The active role in the evaluation of the experiences, in selecting the components that would lead to a better development should belong to the one that teaches. The society should come up with complex learning activities, to assist and support, so a person may grow on the path he considers right.

To achieve these things education must be built as a smart process, sensitive to context, to students and to their results. It can achieve this only if it integrates all the elements of a smart system: 1. a platform with real time information about training in using the cultural instruments, the awareness of attitudes and the valorization of experiences; 2. a system based on respect, principles and clear attitudes appropriate to human nature; 3. a large palette of instruments that can be used and also the correlations between the personal needs and the needs of the system in which education is developed; 4. the needs it answers to must be very clear.

To build a platform with information about the entire learning process, concerning not only the cultural instruments but also their integration and utility, the best solution is an online platform. It can be a mirroring instrument of the one who learns and a knowledge instrument for the one that helps and supports the efforts. And thus, the educational endeavor is individualized and becomes majorly effective.

A good understanding of the self of the student is not possible without knowing the precise way in which the smart systems work and their programming. To this

one must add concrete approaches of evaluating all the elements that determine the usage of certain software and cultural instruments throughout the learning cycle. Not only the people need to learn but also the systems they form together.

15.7 The Extension of the Transcultural Perspective and Smart Education Concepts to the Systems Formed by People

Duhigg [3] presents a way in which the skills are developed and can be changed. It is relatively easy to observe the similarity between them and the functions on smart machines. The skills always follow a result, a reward that can be assimilated to the needs for whose meeting the smart products are built. They have external triggers, and to be properly executed must consider certain internal and external variables, which corresponds to the data on the information platforms. The decisions are integrated in skills, and to properly execute the specific tasks, certain routines and procedures are followed, like in the case of the software.

In this case we can say that to manage the participation, the brain develops mental software to use the instruments, like I have explained in the case of the drivers. As the neural pathways are becoming secure through repetition to control the implementation of the tasks, they are carried out much easier, until their aware involvement is no longer necessary. And the hypothesis of the mental software sustained by other researchers (Bruce Lipton, John Lilly etc) is also sustained by the interesting phenomenon of moving the area that controls the execution of the skills in the basic ganglia, Duhigg, [3]. This process is similar to compiling of the programs and integrating them into the operating systems to be run faster and safer. The skill does not become uncontrollable because it is easy to observe what we do with our conscious mind, and recording it is sequential, which means we can intervene anytime in the operations, decisions and the purpose we follow etc.

Duhigg [3] also argues the fact that not only people have skills, but also the organizations, the communities, the nations. The fact that there are organizational cultures, a culture of the communities and nations are arguments for this opinion. Within them, mental software is found and it is relatively easy to identify by observing the activities. Moreover, the means to change the skills in organizations is the word, by modifying the understanding of the concepts and the perspective, as Zaffron and Logan show [12].

All these organizational skills can be executed without becoming aware of them, just like the man can live without knowing what makes him an intelligent being and how he can quickly and significantly improve his participation. But just like the man cannot take over completely the control over himself without recognizing himself as a smart system, also the teams, the organizations, the communities, the nations will not have a high self-control and an aware participation without building themselves as smart systems.

Just like man, being systems, the teams, the organizations, the communities and the nations have three basic psychological needs. Without them they cannot develop as systems with self control. Taking into consideration and observing their decisions, the instruments they use, the experiences, the entire cycle of interdependences, allows an improvement of the state of these systems and their evolution to quality

participation to the integrative systems.

The transcultural perspective makes sense not only horizontally, by reporting to the similar cultures, but also vertically, by reporting to the cultures of the integrative systems. Man can evolve without serving any functions in the integrative systems like a family, a team etc. But it matters what function the family has inside the society, the team inside the organization and the organization inside the community. If there is no alignment of the goals and consent on the system of values, of decisions, of the instruments used, man not being able to participate with all his resources, will pull him back from total involvement. For example, the leaders cannot expect quality participation, achieving coherence in a team, organization if they do not truly respect their team members and do not demand respect between them. And the respect means recognizing others as smart and autonomous systems with basic psychological needs that must be considered.

What helps achieving internal coherence, authentic individualization and a good cooperation of the person is spirituality. It is the same for a team, an organization, a community or a nation. Without reporting to timeless realities and values like long term coherence, sustainability, respect, the momentary interests can destroy the systems by lacking coherence in the activity of the participants.

Because of this, Covey [19] discovers and supports the idea that the trust is based not only the competence but also on character. But we can talk about the character and the competence of any supra-individual system. And the teams, the organizations, the communities and the people can be trustworthy or not, some can even pose as a threat to the other systems.

The transcultural perspective allows an observation of the systems from this point of view. It ensures the awareness, so the actors involved, no matter on which level, do not act anymore led by instincts and impulses, but by deep needs that do not contradict each other. It is easy to observe this, you do not need to exploit other systems to achieve autonomy, competence and the capacity to integrate and interconnect. On the contrary, any manifestation that lacks respect moves the systems away from meeting the needs, the autonomy is not real, the competence is not reached and we cannot even mention the authentic integration.

In order to evolve any system needs to learn. Learning is efficient if it helps it become a smart, an intelligent one. Smart can be understood, in this case, as the art of managing the system (System Management ART). An education that integrates this, the complete learning process is a smart education. It cannot navigate only towards the man as a system; it must also consider the team, the organization etc. In this respect, there is a general preparation of man that can be offered by society, but one is also required inside the teams, organizations etc.

The teams can have smart people and they do not need to be smart if they do not become self aware in this perspective. The more people are aware of what being smart is, the quicker we can form a smart team. The more smart teams there are the quicker a smart organization can be created. We can see things similarly at the level of communities and nations.

The experience in self-managing is not sufficient in reaching the cultural levels 4 and 5 [20]. It is necessary to be part of a team and to be well integrated inside it to reach level 4. Also, to reach level 5, the man and his team must become useful to society, even to the world, as a validation of his authentic training on all the components.

It is obvious that creating a smart team, a smart organization, a smart commu-

nity etc refers not to the smart technology they use but to the way they are as a system. To become that, to go from the childhood of the group to maturity, one must take into consideration the basic psychological need from a transcultural perspective.

15.8 Conclusions

The mechatronics era can bring to man what McLuhan anticipated, a good live for him and for all the forms of integration and participation. It is possible because through an analogy with the functioning of the smart, integrated systems from mechatronics man can be better understood, like the systems he participates to. In normal conditions, man is not fully free and capable of an authentic collaboration due to the cultural limitations. But this thing can change if a transcultural perspective is consequently adopted. This recognizes sources of instruments and mental software in cultures that people can use to improve their lives.

The personal programming that integrates the cultural and genetic programming is a quite difficult process that man must "travel" to take complete control over himself. To succeed, the biggest support comes from spirituality. But because it is not fully aware of its purpose it often falls in a type of culture.

The current education lacks real respect for man seen as a smart system. It does not allow the satisfaction of the basic psychological needs or a natural, conscious evolution of man.

The smart education presented in this paper is based on the transcultural perspective and can overcome these limitations if it consequently supports those who learn an advanced management of instruments, actions, attitudes, aiming for satisfying the basic psychological needs. This type of education and a transcultural perspective are necessary for teams, organizations, communities and nations too. It results from the fact that they are systems that need a self control and quality participation.

A good understanding of technology as a means of development and not as purpose in itself can lead to a major transformation of man and society like never before. This can happen because it allows functional models to be built for man and the systems he is part of based on mental software. They represent a good understanding of information that determines the actions; they allow it to be much easier improved so that life can become truly fulfilled.

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CHAPTER 16

Poetry and Quantum Physics: Towards the Same Realism?

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This chapter focuses on the concept of reality in Adonis' poetry and the theoretical physics developed by Basarab Nicolescu. Do they conceive reality in the same way? In this brief comparison, I seek to show that, despite different languages, poetry and quantum physics tend towards the same realism, namely the deep conviction of a veiled Real manifesting itself under numerous faces. These two activities that aim to know and reflect reality are based on how we live our relationships with all forms and at all scales of life. Consequently, they depend on both the object as an absolute entity and the subject who lives it, that is, on the subject-object connection. Beyond this famous relativism which is not the only criterion for the quantum and poetic conception of reality, the main debate, which will be mine in this article, concerns the absolute existence of the objective reality and therefore the way to access and describe it.

Keywords: Reality, real, realism, poetry, physics, Adonis, Basarab Nicolescu.

16.1 Introduction

In the 15th canto of his long poem titled *Adoniada*, Adonis wrote this enigmatic sentence: “Life is a metaphor although it has been called reality¹”. Given this unusual definition of life, Adonis changes the main postulate of the classical conception of reality, namely the image is not reality, it is rather a copy. He also subverts the common idea – reality is true whereas a copy is false – by conceiving image and reality as identical forms. According to the conception of a new materiality of life – based on images, how could we be wary of images, as for example the French poet Philippe Jaccottet invited us to do in 1975?² In fact, even his poems are carried by a reverie. Then, how could he truly avoid the deep immersion in images? In 1987, as he himself acknowledged in *A Secret Transaction*, he finally betrayed the

¹Adonis, *Adoniada* is a collection of unpublished poems I am translating into French. “Wal-hayat majáz wa in sumiyyat wāqi'an” (my translation).

²Philippe Jaccottet, *À travers un verger*, Paris, Gallimard, édition électronique, 2015 (1984), empl. 83. “Méfie-toi des images”.

model of “a poetry without images” that he had imposed on himself and explained this change saying: “I got carried away over the images. [...] I let reborn in me the metaphor of the night.”³ In fact, he could not access to reality without the images because, as Adonis puts it, “everything is a metaphor”.⁴ In the same way, Basarab Nicolescu wrote in *The Hidden Third* that “in our age it’s no longer the image that has to conform to reality, but reality that has to conform to the image.”⁵ To put it quickly, Adonis and Basarab Nicolescu conceive the figurative expression both as an informed shape that we have to refer to and as a starting point for rethinking reality. It means that the figurative expressions are not a copy of the reality but it is rather its manifestation, that is to say a form that manifests and veils the Real in the same time. From this point of view, they are not only a tool for describing and revealing the Real – therefore creating or consolidating a reality – but also a tool for measuring and experiencing it.

16.2 Mathematical and Poetic Languages

On hearing that the Manhattan project supremo Robert Oppenheimer was writing poems, a puzzled Dirac remarked in a rare outburst of transdisciplinary criticism: “I do not see how a man can work at the frontiers of physics and write poetry at the same time. They are in opposition. In science, you want to say something nobody knew before, in words which everyone can understand. In poetry, you are bound to say something that everybody knows already in words that nobody can understand.” This anecdote, well-known amongst theoretical physicists, expresses the idea that poetry is fundamentally useless since its language is incomprehensible and what it seeks everyone already knows. It is an ancient and famous story since Plato: poetry is regularly condemned and banned for different reasons. But, Dirac’s objection is unfair. It may be supposed here that Dirac did not know what is really at stake in poetry, not to mention his bad faith about mathematical language. Indeed, like most of poems, Dirac’s fundamental equations are not immediately accessible to everyone. In fact, his biographer Graham Farmelo has compared his equations to haikus. Despite Dirac’s objection to poetry, the following question arises: would he not have finally tried to compete with poetry? His aesthetic sensibilities were similar to those of the poets. He was fascinated by the beauty of mathematical formulas claiming that beauty lies in mathematics. When he argues, as quoted above, that science increases knowledge and approaches the truth through a clear language, he implies that the beauty of this language is a sign of truth. In other words, the mathematical beauty would be understandable, not to say universal, because of its simplicity and elegance, and therefore mathematical beauty would above all guarantee access to knowledge and truth. However, beside these two aesthetic criteria of beauty common to those of poetry, no offense to Dirac, is there no other fundamental but invisible criterion? In the article of *The Guardian* on the 21st November 2016

³Philippe Jaccottet, *Une transaction secrète. Lectures de poésie*, Paris, Gallimard, édition électronique, 2015 (1987), empl. 384. “je me suis laissé emporter au fil des images; j’ai laissé renaître au fil des images ; j’ai laissé renaître en moi la métaphore de la nuit”. (My translation).

⁴Adonis, *Adoniada*, unpublished, song XX. “Kullu shay’ majâz.” (My translation).

⁵Basarab Nicolescu, *The Hidden Third*, translated into English by William Garvin, Quantum Prose, 2016 (1994), p.67.

about Dirac's equations, "Magic Numbers: Can Maths Equations Be Beautiful?"⁶, Ian Sample adds a criterion and explains beauty as follows:

What does it mean for maths to be beautiful? It is not about the appearance of the symbols on the page. That, at best, is secondary. Maths becomes beautiful through the power and elegance of its arguments and formulae; through the bridges it builds between previously unconnected worlds.

Indeed, mathematics translate into equations these bridges that are possible "between previously unconnected worlds". Curiously, Ian Sample uses a metaphor here to describe a common scientific experiment, namely the observation or creation of possible links between unconnected worlds. Yet, in 1994, Basarab Nicolescu had already given a scientific name – inspired by philosophy of science and logic, to the image of "bridge" as evoked in the poetic theorem below:

A bridge between the unknown and the unthinkable: The Hidden Third.
Thus, the known and the thinkable are born. (2016: 22)

Similarly, it can be argued that poetry translates the Hidden Third into poems. To quote Adonis, for example, whose poetry is an attempt to show the possible and invisible links between us and the unknown, his last long poem can be read as an epic to the unknown or an invitation to explore the unknown. He uses the same metaphor to describe the interconnection between human and cosmos as in these lines:

Do not imitate
that creator –
Invent
a new creator for a new futur
and say with ardor:
between heaven and me, there are only
bridges
of air and dust.⁷

But, unlike Ian Sample, Adonis suggests here that we are all connected to the cosmos as if we were to first accept this postulate to honestly observe and acknowledge our present situation in the world, and then begin to truly explore our invisible connections with different worlds. The "bridges of air and dust" literally refer to these connected phenomena and their related scientific questions such as: what is the matter? Or what is the light? Or what is the reality? In this poetic model of the world, the main idea is that, as Basarab Nicolescu puts it about Gregorio Morales involved in the quantum aesthetics' movement, "everything is interconnected, non-separated"⁸. Despite the fact that Adonis did not seek to create a quantum aesthetic in his poems, the reader can easily acknowledge a view of life similar to that

⁶Ian Sample, "Magic Numbers: Can Maths Equations Be Beautiful?", *The Guardian*, Nov. 2016. Consulted on the 6th December 2018, <https://www.theguardian.com/science/2016/nov/21/magic-numbers-can-maths-equations-be-beautiful>

⁷Adonis, *Adoniada*, unpublished, song XI. (My translation)

⁸Basarab Nicolescu, *From Modernity to Cosmodernity: Science, Culture, and Spirituality*, New-York: SUNY Press, 2014, empl. 3124.

of Morales. In this type of aesthetics, the reader can see the collapse of dichotomies such as “matter” versus “mind” or “spirit” because the metaphor itself (re-)actualizes the potential information available in the Real. To recall the general definition, the metaphor represents something, invisible or not. But it does not just create a shape or an image. It also reveals a connection with something else. The metaphor is the mental movement that associates one thing with another. In other words, it is a kind of a geometrical translation that is necessarily also a transformation and that can be noted both by equations and poems.

16.3 Connected Worlds and the Hidden Third

Thus given a metaphor, we must accept the mental displacement from a reality to another to understand it and see the reality differently. This means that a metaphor or an equation is initially hermetic and requires one to experiment with a new point of view. In this respect, “life is really a metaphor although it has been called reality”. In Arabic, Adonis used the word “majâz” which I translated above as “metaphor”. However, in Arabic rhetoric, as explained by Nejmeddine Khalfallah in his doctoral dissertation, Jurjânî, a renowned Persian scholar of the Arabic language dead in 1078, called “majâz” “any reasoned change of meaning or language, departing from the usual way of expressing oneself”⁹. Thus, to be more precise, I should have rather translated “majâz” by “figurative expression” because the “majâz” encompasses all the tropes that signify the transition from a proper meaning to a figurative sense. According to the dictionaries, this Arabic notion includes the comparison (*tashbîh*), the metaphor (*isti’âra*) and the analogy (*tamthîl*), namely rhetorical processes based on similarity or differentiation. Thus, the very original conception of figurative expression of Jurjânî is very useful here to compare equations with poems, or the scientific language with the poetic one because both use figurative expressions structured by logical links. As demonstrated by Jurjânî and explained by Nejmeddine Khalfallah, the meaning and the value of figurative expressions derive from the logical relation that connects the two terms of an equivalence or an image, hence the figure of speech conceived by Jurjânî as “a logical equation”.¹⁰ This kind of logical equation does not figure the principle of the dialectic based on an antagonism. We must rather understand it as the expression of the “trialectic” that Stéphane Lupasco coined to describe antagonistic dynamics. Nourished by the thought of Heisenberg and Bohr, Stéphane Lupasco wrote many books about the logic of the included third and the binary thought. He showed that contradictory energies cannot exist outside a ternary structure noticeable by their dynamics. It means that dynamics or “the logic of the energy”, as named by Lupasco, implies a state T that includes the two contradictory terms, hence the expression of the included third. In other words, as Basarab Nicolescu puts it, “in a triad of the included third, the three terms coexist at the same moment in time”.¹¹ In sum, the trialectic or “the logic of the energy” must be figured by three terms: A, non -A and T. But to what extent is a logical equation or a figurative expression inherent to the logic of the energy? In other words, to what

⁹Nejmeddine Khalfallah, *La théorie du Ma’nâ d’après ‘Abd al-Qâhir al-Jurjânî (d. 1078)*, Paris: L’Harmattan, 2011, p. 179.

¹⁰Nejmeddine Khalfallah, *La théorie du Ma’nâ d’après ‘Abd al-Qâhir al-Jurjânî (d. 1078)*, Paris: L’Harmattan, 2011, p. 179.

¹¹Basarab Nicolescu, *From Modernity to Cosmodernity: Science, Culture, and Spirituality*, Albany, State University of New York Press, 2014, ebook, empl. 2582.

extent is a figurative expression the sign of the included third? Basarab Nicolescu answers in a very innovative way in his latest essay, *From Modernity to Cosmodernity: Science, Culture and Spirituality* (2014). Indeed, he shows that the logic of the energy allows us to compare the quantum world and the psychic world, or to be more precise, to compare their representations of the reality. He relies on Lupasco's philosophical reflection to highlight the logic of energy at work in the symbol. His commentary on the included third must be repeated here:

The included third does not mean at all that one could affirm one thing and its opposite – that, by mutual annihilation, would destroy any possibility of prediction and therefore any possibility of a scientific approach of the world. It is rather about recognizing that in a world of irreducible interconnections (such as quantum world), conducting an experiment and interpreting experimental results are inevitably reduced to a cutting up of the real, which affects the real itself. [...] Due to the rigorous development of his axiomatic formalism, Lupasco postulated the existence of a third type of antagonistic dynamics, which coexists with that of heterogeneity, which governs living matter, and with that of homogeneity, which governs macroscopic physical matter. This new dynamic mechanism assumes the existence of a state of rigorous, precise balance between the poles of a contradiction, in a strictly equal quasi-actualization and quasi-potentialization. This state, which Lupasco calls the T state (“T” being the initial for the included “third”), characterizes the quantum world and the psyche world.¹²

But this state T remains totally logical. As defined by Lupasco, it cannot unify contradictories because the contradictories themselves are located in the area of resistance, namely the main characteristic of reality. Scientists define reality in terms of resistance. Therefore, Basarab Nicolescu distinguishes the words Real and Reality as follows:

Real designates that which is; Reality is connected to resistance in our human experience. “The Real” is, by definition, veiled forever (it does not tolerate any further qualifications); but “Reality” is accessible to our knowledge.¹³

However, a fundamental characteristic of the included third was missing here to explain more exactly how it could unify contradictories. Basarab Nicolescu complete the formulation of a unified theory with the Heisenberg's model of different levels of Reality and the concept suggested by Michel Camus of “the secretly included third”. According to him, “the zone between two different levels and beyond all levels is a zone of *nonresistance* to our experiences, representations, descriptions, images, and mathematical formulations”.¹⁴ This is precisely the secretly third, named by Basarab Nicolescu “the Hidden Third”, that crosses the area of nonresistance and ensures the unity. One can understand here that the binary logic is deadly whereas the ternary logic based on the Hidden Third is fundamental. To quote a poetic theorem of Basarab Nicolescu: “Binary logic is deadly. Always seek the Hidden Third.”¹⁵ The

¹² *Ibid.*, empl. 2662.

¹³ *Ibid.*, empl. 4161.

¹⁴ *Ibid.*, empl. 4237.

¹⁵ Basarab Nicolescu, *The Hidden Third*, *Ibid.*, p. 112.

Hidden Third and the symbol are based on a ternary structure. But do they have a similar role in the logic of the energy? As written by Gilbert Durand and quoted by Basarab Nicolescu, “the symbol is [...] a representation which makes a secret meaning appear, it is the epiphany of a mystery.”¹⁶ Comparing the scientific thinking and symbolic thinking, Basarab Nicolescu states that “the symbol and the logic of the included third are intimately linked”¹⁷ mainly because the symbol implies the unity of the contradictories. Therefore, we can say that the difference between the symbol and the figurative expression is similar to the difference between the hidden third and the included third. Thus, one can easily understand here to what extent arts can provide to each of us fundamental experiences, especially poetry.

The genius of the poet consists in showing the profound and sometimes unsuspected unity at work in the poem insofar as it governs the principle of symbols and even figurative expressions. By reading this kind of poetry, we can really feel it and be literally touched by its expressions so deeply that, at the same time, we are immediately linked to the Real despite our difficulty to grasp its deep meaning. Admitted that reality is what resists at all level of perception, the Hidden Third is the link that expresses and reveals unity between all levels and the Real is what encompasses all realities, including the poem itself. Therefore, the Real is unity and the poem is its most accessible truth. In *Adoniada*, Adonis uses very often the word “path” / *tarîq* which is quite different from the word “bridge” / *jîsr*. The first has many meanings that includes the following notions: the road, the method, the manner, the means, the creed and the direction. “I will sing the path”, says the poet. Although Basarab Nicolescu used the bridge to represent the Hidden Third, the poetic path is in fact, in this poem, a symbol par *excellence* that functions as the hidden third while the bridge is rather the proper image of the included third.

16.4 Poetry and Quantum Physics: A Symbolic Path to the Real?

Poetry or quantum physics, remain a symbolic path to the Real. In this sense, the path is the main feature of a new realism common to these two disciplines as well as to others. The path is the index of a quest itself, scientific or spiritual, and of all its experiments rather than an access to the knowledge of the world or humanity. The richness of this word, besides its several meanings, lies in the fact that it has both individual and universal scope. The individual path gives meaning and direction to our life and, therefore, shapes our way of life whereas the universal path is the discovery of spaciousness. As a symbol, the path unites the subject and the object, and harmonizes the vision, the language and the act of displacement in a rare rightness. To take an example, in *Adoniada*, the path first refers to the road taken by the poet from Syria to France, which is the terrestrial road of his exile. And we know that exile exists only through the idea of the separation of East and West on Earth. How else could we feel in exile if the Earth was seen and lived in its unity? This is somehow the implicit bet that Adonis makes when he says in these lines:

¹⁶Basarab Nicolescu, *From Modernity to Cosmodernity: Science, Culture, and Spirituality*, *Ibid.*, empl. 732.

¹⁷*Ibid.*, empl. 742.

Is the East distanced from the West, giving its heavens to another moon?
I will continue my journey.
Everything is metaphor.

Thus, his journey or path is not only terrestrial, passing from one country to another, but it is also spiritual. The external exile is the image of an inner exile far from the Real. It should be noted here that *Adoniada* is presented as a poetic testament that recounts the poet's most important journeys, hence the title derived from his name Adonis. It is clear that even his memory of exile brings East and West together in one path that is Adonis' body. Here is an example of the way the poet suggests the unity of East and West through the evocation of Sindbad and Ulysses:

Is the East behind me and the West not in front of me?
Two banks for a single river Sindbad
ventures into the Ulysses' sea on a planet that does not consist of East
and West,
one single body

But this long poem, also written as a realistic epic, bears witness to a wandering path that has lost the poet in the unknown or spaciousness.

Where does my path lead? As if the discovery of the path
was a misguidance

What is at stake here is precisely the discovery of a spaciousness in the body. To put it in another way, the path literally disorientates the one who seeks a destination. It leads to the spaciousness whether in the body or in the cosmos. And the path can be inscribed in the core of poetry as is the case in Adonis' poem, or in theories of quantum physics, as is the case in the poetic theorem of Basarab Nicolescu. To quote one of his eloquent theorems:

The shortest path from the infinitely small to the infinitely large is
through the infinitely conscious.¹⁸

To repeat, spaciousness could be felt in the cells of the body and result in a feeling of disorientation that causes especially confusion of thoughts. Therefore, in poetry, the common language no longer becomes understandable because it reveals spaciousness in the moment rather than it expresses a kind of temporality. And the poet longs for this disorientation because the thought is always an illusion while disorientation, namely the path to the unknown, is a path to the Real. The confusion that appears to the reader of a poem is precisely the first step towards the Real insofar as the symbolic language connects different levels of reality and highlights that zone of non-resistance where the hidden third or the symbol acts. The reader no longer needs to understand the meaning. It is enough for him or her to feel the movement from one level of reality to another. In Adonis' poem, the body, the Earth and the cosmos are different levels of reality connected by symbols. The path is one of them. As suggested by the poetic theorem of Basarab Nicolescu cited above, it leads to spaciousness that is consciousness. Or, to say it with the words of Adonis, "the universe is penetrated and deflowered by a consciousness that is neither you, nor her, nor him, nor us, nor them". So, we can feel here the presence of the consciousness

¹⁸Basarab Nicolescu, *The Hidden Third*, Ibid., p. 140.

because the poet wrote a poetic testament that is neither a commitment in a story nor a legacy of thoughts and beliefs, but rather the testimony of a possible obliteration of the subject and the object.

16.5 What If the Path to the Real was Deeply Unscientific?

When Baudelaire said that “every gifted poet has always been realistic”,¹⁹ he requires the poet to be a meticulous observer of the outer and inner world. In an article titled “Realism in Poetry”, Sophie Guermès summarizes the links between French poetry and realism at the turn of the twentieth century saying: “Thus, from Baudelaire to Cocteau, realism in poetry, for those few who venture to bring the two terms together, is a lyricism based on observation and sensation, and - logical consequence but not necessary - tending to the globalization”.²⁰ In France, we can notice that the main debate about realism in poetry remains focused on the following question: which of the subject or object is the closest to the Real or the most reliable? Neither or both, answered a few poets. As noticed by Sophie Guermès, French poets of the twentieth century sought to describe the very act of poetry. She takes the example of Yves Bonnefoy to explain how, during the emergence of a so-called “objective literature” (Roland Barthes), he defended the idea of a “subjective intelligible” (“un intelligible subjectif”) that can reveal “the truth of speech”. Unlike other poets who conceive the reality from a classical thinking based on separation, Yves Bonnefoy makes the poetry “the resource of the path”.²¹ According to him, the word itself is intelligence because it can break our engagement with the object of memory and leave us in the pure presence of the Being.

Thus, poetry leads us to a larger consciousness where our personal relationship with the outer world is no longer meaningful. To define realism in poetry, Bonnefoy gives a more accurate and interesting expression. Poetry is, as he puts it, an “initiatory realism” if it opens up to the Real by arousing in ourselves the feeling of the presence. It is in the pure presence that, according to Bonnefoy, the world exceeds the “objective intelligible” (“intelligible objectif”) of a scientific approach. In this respect, many poets such as Bonnefoy think that science cannot lead us to what is, as directly as a poem. For example, Saint-John Perse whose poetry has strongly influenced Adonis states in his speech at the Nobel banquet that “the real in the poem seems to inform itself”.²² However, unlike Bonnefoy who was wary of images, Perse explains the complicity between the Real and the poem as follows:

By the analogical and symbolic thinking, by the distant illumination of the mediating image, and by the set of its correspondences, on a thousand chains of reactions and foreign associations, by the grace finally

¹⁹Charles Baudelaire, “Puisque réalisme il y a”, in *Œuvres complètes*, Paris : Gallimard, La Pléiade, 1954, p. 992.

²⁰Sophie Guermès, “Du réalisme en poésie”, [“Realism in Poetry”], *Poétique*, vol. 166, no. 2, 2011, pp. 171-184 [my translation].

²¹Yves Bonnefoy, “L’acte et le lieu de la poésie”, [“The Act and the Place of Poetry”], in *L’improbable et autres essais*, Paris : Gallimard, 1992, p. 131.

²²Saint-John Perse, “Discours de Stockholm”, in *Œuvres complètes*, Paris : Gallimard, La Pléiade, p. 444.

of a language where the movement itself of Being is transmitted, the poet invests himself in a surreality that cannot be that of science.²³

Adonis is more severe: “In vain, I question the science: there is science only mixed with ignorance”. Even if Perse says something true about poetry, can we really say, like some poets, that the path to the Real is unscientific?

To answer briefly, we can argue that the presence, never defined by Bonnefoy, is a self-consistency. Suppose that this presence is perceptible at all levels of reality, but, in fact, we can only apprehend it at a certain level which depends on the optimum conditions of observation. In physics, the self-consistency is known as the bootstrap principle. According to Basarab Nicolescu, the bootstrap model, coined by Geoffrey Chew in the 60s, “has emerged as a natural reaction against classical realism”.²⁴ In this model, the terms reality and real are no more conceived as a set of entities characterizing material substance and, therefore, as entities objectively measurable. But, as explained by Basarab Nicolescu, “the bootstrap principle is both *organizational* and *structuring*: an *infinite* number of self-consistency conditions determine the existing particles in a *unique* way”.²⁵ It has important consequences developed by Basarab Nicolescu in his essay as follows:

The bootstrap has important implications for the nature of scientific prediction. The knowledge of the whole claims a long and patient investigation. Therefore, it must be admitted that one looks for ways of approaching self-consistency with the conviction that behind the approximation hides a fundamental coherence, a rational order without gaps: once we obtain partial information of the real world, knowledge of the rest of the world is not arbitrary – it is obtained by self-consistency.²⁶

Although a partial bootstrap such as the hadron bootstrap is scientifically productive and effective, Basarab Nicolescu acknowledges, like Chew himself, that “under its very general form, the bootstrap principle has, with the current state of knowledge, an *unscientific* character”.²⁷ As described above, the bootstrap has the symbol properties. Thus, it would be, as Basarab Nicolescu puts it in his poetic theorems, “a bootstrap of words”²⁸ that, nevertheless, remains an “open theory”.

16.6 Conclusion

To conclude this short comparative study, we must remember that poetry and quantum physics offer models of the reality and the Real based on a principle of unity and self-consistency. This is the common vision of these two disciplines. Beyond the lexicons specific to each of them, we can consider this vision of the world as the same realism.

²³ *Ibid.*

²⁴ Basarab Nicolescu, *From Modernity to Cosmodernity: Science, Culture, and Spirituality*, *Ibid.*, empl. 1870.

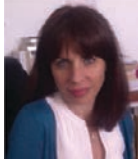
²⁵ *Ibid.*, empl. 1906.

²⁶ *Ibid.*

²⁷ *Ibid.*, empl. 1917.

²⁸ Basarab Nicolescu, *The Hidden Third*, *Ibid.*, p. 56.

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CHAPTER 17

The Fear and the Sacred: The Ontology and the Phenomenology of Theophobia

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The present study aims to analyze the relationship between fear and sacred, but also the theophobic forms from a pluri-, inter- and transdisciplinary perspective. In the Introduction, are addressed the nature of fear, the distinction between fear and anxiety, metaphysical anguish, the range of manifestations related to God, sacred, religion, saints, places of worship, religious rituals, prayers, etc. The following chapters address Phenomenology of Fear, The concept of fear and anxiety at Kierkegaard, The Existential Analysis of Fear at Martin Heidegger, Theophobia, Divine Antropophobia, The symptomatic picture of theophobia, The causes of theophobia and Metaphysical etiology of phobic behavior. In conclusion, the objective, major cause of theophobia is religious doctrines, according to which the origin of the universe is a punitive, avenging creator, etc. Strong knowledge of the ancient mythology, the history of religions, archaic theogonies, religious phenomenology, archetypal psychology, cultural anthropology, philosophy and science shelters not only the idea of a "celestial ontological dictatorship", but also the fear inspired by such a divine spectrum, anthropomorphized.

Keywords: Fear, sacred, ontology, phenomenon, God, metaphysics, anxiety, theophobia, divine antropophobia, anguish, unconscious.

17.1 Introduction

Fear has always kept company to humans as a second shadow. Consequently, the human being could be correctly defined as a *being-that-fears*. We are afraid of God, we are afraid of our neighbors, we are afraid of ourselves, we are afraid of the other sex, we are afraid of wild animals, we are afraid of viruses, bacteria, fungi and parasites, we are afraid of death, we are afraid of natural phenomena, and, eventually, we are afraid of our own fears (phobophobia). Our appeal to divinity, life partner, guardian angel, friends, etc. - all these are attempts to seek for a support to save us from the abyss of fear.

Fear is an emotion of universal character which helps us survive as individuals and eventually as species as it functions as a genuine alarm system. It signals danger and makes us react instantly to danger.¹ But when fear becomes persistent, obsessive, exaggerated as related to the danger degree that the facing of a certain situation supposes, we speak about phobia and phobic behavior.

After making a distinction between fear and anguish – anguish is specific to humans, whereas fear is present in animals' behavior as well – Jean Delumeau, in his famous *La Peur en Occident (XIVe-XVIIIe siècles)*, asserts that man tried to vanquish fear fragmenting it into peculiar fears: fear of the sea, of the tempest, of famine, of sin, of the devil, of the end of the world, of death, of the inferno, of pest, of strangers, of witches, of ghosts, or the fear of own self.²

Human fear has an infinity of forms, shades, and degrees, being thus incompatible with animal fear: the fear of being devoured by other species, “while human fear, the offspring of our imagination is not a unitary, but a multiple one, not fixed, but an ever-changing one.”³

From the fear of our ancestors of wild beasts or of ghosts to the modern man's fear of the unpredictability of the economics fluctuations, fear has remained the same, even if its object is a different one.

Anguish and anxiety are intrinsic statuses of human beings, specifically of sensitive, metaphysically lucid people. They are not psychopathological statuses in themselves, of course excepting some obvious psychoses, forms of schizophrenia or anxious flutters within some organic diseases such as angina, bronchial asthma, hyperthyroidism, etc.

Besides, the serious dissertations of psychopathology make a distinction between metaphysical anguish - as it appears at Augustine, Pascal, Kierkegaard, Heidegger, Sartre, Jaspers, Gabriel Marcel or Emil Cioran - and other forms of anguish.⁴

Theophobia is generally defined by psychologists as an irrational fear of religion, of God's wrath, of gods, or of sin. There is an entire range of phobic manifestations related to God, religions, sacred, saints, prayers, temples and cult objects, religious rituals: sacrophobia (fear of sacred objects), hamartanophobia (fear of sin), stavrophobia (fear of the cross sign), eschatophobia (fear of the end of the world and of the last Judgement), atherophobia (fear of being deprived of the idea of God, fear of not having God as a supreme goal in life), phasmophobia (fear of ghosts), demonophobia or satanophobia (fear of demons), espectrophobia (fear of phantoms), estigiophobia or hadephobia (fear of hell), hagiophobia (fear of saints or blessed objects), homilophobia (pathological fear of sermons), Hexakosiohexekontahexaphobia (fear of the number 666), hierophobia (fear of priests), mythophobia (fear of myths, false stories or false assertions), Theologicophobia (fear of theology), Theophobia (fear of God), ecclesiophobia (fear of the Church), teletophobia (fear of religious rituals), hierophobia or hagiophobia (fear of religious or holy objects), heresyphobia or heresophobia (fear of challenges to the official doctrine or fear of losing the way of own belief, the

¹Irena Milosevic and Randi E. McCabe, Editors, *Phobias. The Psychology of Irrational Fear*, Greenwood, An Imprint of ABC-CLIO, LLC ABC-CLIO, LLC, Santa Barbara, California, 2015, Introduction, p. XIII.

²Jean Delumeau, *Frica în Occident (secolele XIV-XVIII. O cetate asediată)*, vol I, traducere, postfață și note de Modest Moarariu, Editura Meridiane, București, 1986, p.40.

³R.Caillois, *Le masques de la peur chez les insectes, în Problemes*, avril-mai, 1961, p.25, apud Jean Delumeau, op.cit., p.19.

⁴See Constantin Enăchescu, *Tratat de psihopatologie*, Editia a III-a, revăzută și adăugită, Editura Polirom, Iași, 2006, p.332.

fear of heresy), sacrophobia (fear of the sacred), eternophobia (fear of eternal life), uriphobia (fear of paranormal phenomena), etc.

The literary, philosophic discourse, the sciences of the soul, psychology and psychiatry, but also the biochemistry and biophysics of the brain provided us with a series of knowledge and data which have shaped a pretty complete image of the causes, the physiology, the semiology and the phenomenology and therapy of phobias in the last decades.

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Ancient literature and mythology abound in descriptions of such reactions towards existence, beginning from the books of the Old Testament to the Greek and Latin writers. Also, the works of some modern and contemporary writers, philosophers, and theologians such as Shakespeare, Soren Kirkegaard, Franz Kafka, Lev Tolstoi, Virginia Woolf, Martin Heidegger, Sigmund Freud, Alphonse Daudet, Hans Urs von Balthasar, etc. have contributed to the understanding of this universal phenomenon of the soul, anticipating the systematic studies later elaborated by psychologists.

17.2 The Phenomenology of Fear

The list of phobias is limitless. Humans can develop phobias of, in fact, anything. All the objects, beings, laws of physics, statuses, situations, events, psychic processes, etc. can become stressful, from snakes (ofidiophobia) or spiders (arachnophobia) to food (sitiophobia), and from the moon (selenophobia) to the cell phone (nomophobia) or the infinite (aperophobia).⁶ Actually, we should all become theoretically phobophobs, that is to say to fear our many potential fears.

⁵Aaron T. Back, Gary Emery with Ruth Greenberg, *Anxiety disorders and Phobias. A cognitive perspective*, Basic Books, Printed in SUA, 1985; David A. Clark, Aaron T. Back, *The anxiety and Worry Workbook. The cognitive behavioral solution*, The Guilford Press, A Division of Guilford Publications, Inc., 1954; Ronald M. Doctor, Ada P. Kahn, and Christine Adame, *The encyclopedia of phobias, fears, and anxieties*, 3rd ed., Facts On File, Inc., New York, 2008; Bernard, E., (Eds.), *Using Rationale Emotive Therapy Effectively. A Practitioner's Guide*, Plenum Press, New York, London, 1991; Bourne, E.J., *The anxiety and Phobia Workbook*, The sixth edition, New Harbinger Publications INC., Oakland, 1995; DuPont, Robert L. *Phobia: A Comprehensive Summary of Modern Treatments*. New York: Brunner/Mazel, 1982. Jampolsky, Gerald. *Love Is Letting Go of Fear*. New York: Bantam Books, 1979. Marks, Isaac M. *Living with Fear* New York: McGraw-Hill, 1980; Markway, B. G., et al. *Dying of Embarrassment: Help for Social Anxiety and Phobias*. Oakland, Calif.: New Harbinger, 1992. Marshall, John R. *Social Phobia: From Shyness to Stage Fright*. New York: Basic Books, 1994. Monroe, Judy. *Phobias: Everything You Wanted to Know, But Were Afraid to Ask*. Springfield, N.J.: Enslow Publishers, 1996. Nardo, Don. *Anxiety and Phobias*. New York: Chelsea House, 1992. Uhde, T. W., M. B. Tancer, B. Black, and T. M. Brown. "Phenomenology and Neurobiology of Social Phobias: Comparison with Panic Disorder." *Journal of Clinical Psychology* 52 (November 1991): pp. 31–40. Zane, Manuel D., and Harry Milt. *Your Phobia*. Washington, DC: American Psychiatric Press, Inc., 1984; Holdevici Irina, *Psihoterapia tulburărilor anxioase*, Editura Ceres, București, 1998; Holdevici Irina, *Psihoterapia anxietății*, Editura Dual Tech, București, 2002; Wells, A., *Cognitive Therapy of Anxiety Disorders*, John Wiley and Sons Chichester, New York, Weinheim, Brisbane, Singapore, Toronto, The 3rd ed., 1999.

⁶See Ronald M. Doctor, Ada P. Kahn, and Christine Adamec, *The encyclopedia of phobias, fears, and anxieties*, 3rd ed., Facts On File, Inc., New York, 2008; Laurențiu Mitrofan, Sorina Daniela Dumitrache. *Compendiu de fobii*. Editura, SPER, 2010.

Man is an ontologically ill being. We are abandoned in a cosmic hospital, in whose yard we wear our clothes as pyjamas. There are tens of millions of bacteria, thousands of viruses, hundreds of fungi, helms and parasites that invade the human being. Tens of thousands of somatic diseases. Only the pathology of the human epidermis counts approximately 6000 affections, not to mention the psychic diseases. The American handbook of *Diagnosis and Statistics of Mental Disorders* (DSM) completes every edition with new mental, behavioural, psychic, psychological disorders etc.

17.3 The Concept of Fear at Kierkegaard

Soren Kierkegaard (1813 – 1855) is not only a great philosopher, theologian and writer, but also a promoter of Psy sciences, as in his ample and profound works, we can find behavioral analyses as related to God, to the world and to the self.

If, at Kierkegaard, the Angst originates in the revelation of nothingness and is distinct from *the fear of something determined* (*Furcht*), at Kierkegaard, restlessness is rather preceding the original sin than it is a consequence of it, being generated by the fear of limit. Thus, Kierkegaard makes a personal interpretation of the biblical episode of the fall, underlining the ostensive character of the law.

According to Kierkegaard, anxiety as an expression of the limitlessness thirst specific to humans was the one that caused the fall of the primordial couple. The divine interdiction to eat from the Knowledge Tree of Good and Evil imposes a limit between what is and what is not permitted, limit that violates the human need of infinity, inducing a state of unrest, an anxiety of the freedom burden: “Supposing that interdiction arouses desire, then here we are a knowledge (instead of an unknown), as Adam must have had knowledge of freedom, since he was willing to use it. This is why this explanation is belated, posterior. Interdiction creates anxiety because interdiction arouses the chance of freedom.”⁷

Thus, anguish becomes co-substantial to the human condition and, implicitly, to the conflict between the finite human condition and his thirst of infinity.¹³ The magnitude of being is given by the profoundness of the anxiety: “Had it been an animal or an angel, the human being couldn’t have been anxious.

Yet, being a synthesis, it can be anxious; the deeper the anxiety, the greater the human, but not in the sense that anxiety is usually seen by people, when it is a reaction to something exterior, outside the human, but in the sense that anxiety is generated by the human himself.⁸

In Kierkegaard’s opinion, prayer feeds from the uncertainty, risk, fear and tremor of the one that prays, for the authentic religious life supposes a permanent state of danger. There are, in his opinion, a dialectic of danger experienced by Abraham, for instance, while he was climbing the Moria mountain in order to sacrifice his son, as Yahve requested. The patriarch accepted the absurd, the divine paradox in spite of rational, human, logic, or legal evidences, suspending any ethical principle. If Abraham had had the intention to kill Isaac without any divine command, he would have obviously been a criminal of the worst kind. In the presence of the

⁷Soren Kierkegaard, *Scrieri I. Conceptul de anxietate*, translation from Danish by Adrian Arsinevici, Editura Amarcord, Timisoara, 1998, p.80.

⁸See Vasile Chira, *Prelegeri de filosofie*, Editura Universităţii “Lucian Blaga”, Sibiu, p.147-157.

divine imperative that asked him such a sacrifice, Abraham becomes, according to Kierkegaard, the first knight of the true faith.

The Danish philosopher identifies three fundamental periods that a human goes through more or less consciously, during a lifetime: The esthetic, the ethic, and the religious, as we can find them in *Or/Or* and in *Fear and Trembling*.⁹

Besides the three stages of spiritual evolution (esthetic, ethic, and religious, to which Beauty, Good, and Truth correspond, Kierkegaard speaks of the so-called intermediary stages: irony, which makes the link between the esthetic to the ethic stages, and the humor, which connects the ethical stage with the religious one. Other attitudes and spiritual stages such as melancholy, fear, desperation, restlessness, repentance, sin, temptation, atonement, and somersault are not considered by the philosopher as intermediary stages, but they are a special importance within the economy of the existential structures, constituting, along the intermediary stages, the flats and the sharps of the existential fugue composed by Kierkegaard.

The object of fear is nothingness. Even so, fear is intimately connected with spirit. In Kierkegaard's opinion, the human cannot overcome his human condition, he cannot reach transcendence but by accepting what he does not want to be.¹⁰

17.4 The Existential Analytics of Fear at Martin Heidegger

The Heideggerian distinction between existence (*Existens*) and subsistence (*Vorhandensein*) was able to radically change the metabolism of European thinking, as for the German philosopher, such a thinking that uses categories should rather address to subsistence and by no means to *Dasein*, which systematically avoids categorial thinking due to the ec-static character of the privileged being. This ontological difference imposes another form of analytics than that of categories, inherited from Kant, namely an analytic of existential character.¹¹

Unlike subsistent beings which could be the object of *categories* (as Kant presents them in his famous table), the *Dasein* cannot be subjected to the categorial, it can be interrogated in an existential manner only, that is to say through *existentials*. Being is not revealed in concepts and theoretic *categories*, but in *affective arrangements*, similarly to a tool which is not revealed when it is looked upon and theoretically analyzed, but when it is used.

As a correlative and complementary term of categories, the existentials have in view the relation with nothingness, with death, and with the world (*Angst*, *Sein zum Tode* and *Sorge*).

But there is the danger that various existentials that articulate the structures of being of *Dasein* to disintegrate the *Dasein* as a whole. In this case, a major, integrative existential is needed, which should at the same time be "the basis of the co-originary structures of the *Dasein*."¹² This modality of supreme openness of the

⁹Soren Kierkegaard, Scrieri I. *Conceptul de anxietate*, op.cit., p.203.

¹⁰See Grigore Popa, *Existență și adevăr la Søren Kierkegaard*, with a preface by Achim Miha, Editura Dacia, Cluj, 1998, p.114-117.

¹¹Vasile Chira, *Dominatele gândirii cioraniene*, Editura Universității "Lucian Blaga", Sibiu, 2006, p. 105.

¹²See G. Liiceanu, *Excurs asupra câtorva termeni heideggereni*, Anexe la Ființă și timp, trad. G. Liiceanu și Cătălin Cioabă, Humanitas, 2012, p. 609.

Dasein is *anguish* (*Angst*) as an essential affective disposition, through which the *Dasein* openness to its own self occurs as *caring*. *Care* (*Sorge*) is for Heidegger the primary and integrative existential.

Care is much more than a simple concern that things, affairs, domestic situation “work well”. It is about a metaphysical caring which puts the *Dasein* face to face with its “possible”, with the perspective of “being no longer”, of death. At an ontic, existential level, this caring is expressed by “concern” (*Besorgen*), “caring for another” (*Fürsorge*), mutual help and dedication, etc. The state of fall (*Verfallen*) makes the *Dasein* to be being as an impersonal ‘it’, which in relation with its own itselfness, is a closure. The falling of the *Dasein* into the every day turmoil is nothing else than a perpetual running from the encounter with one’s own self.

The inauthenticity of the *Dasein*, its fall into the everyday routine is a poor temporality, an intratemporality in which *Dasein* is enslaved to vulgar temporality, it loses its primary quality to produce time to time itself.¹³ *Dasein* cannot be stopped from this unconscious running from itself except for the moment when anguish occurs. In anguish, the world appears to be devoid of meaning, it reveals as “nothingness”, setting us in front of the fact of being in the world. Anguish instantly detaches us from the herd, individualizing us, bringing us back into genuineness.¹⁴

17.5 Teophobia

Divine mystery inspires a feeling of awe, which is a part of fear. Many ritual gestures express obedience, compliance, humbleness: eyes closed, head bowed, and hands together in prayer, kneeling, silence. Sacrifices, offerings of food, animals, and even humans are common for religions as well. The aberrant logic of the Aztec Indians according to which the Sun wouldn’t rise and move through the sky without a daily sacrifice is a famous illustration of the fact.

On the other hand, we must acknowledge the fact that the act of prayer as a dialogue between a human and a paternal almighty entity, be it real or imaginary, transcendental to the seen world - has a cathartic function, working as an anxiety reducer. This thing takes place at a conscious level, yet at an unconscious level, the fear induced to the child through the religious imperatives and the idea of punishment do not disappear, but they will continue to affect the mental sanity of the future adult.¹⁵

The idea of a punitive, vengeful divinity appears at the same time with the first religious doctrines and was reinforced throughout history by the tragic episodes that mankind experienced: wars, calamities, diseases, famine, etc. This dimension of divinity is closely connected with one of its moral attributes: justice, so often

¹³Otto Pöggeler, *Drumul gândirii lui Heidegger*, trad. de Cătălin Cioabă, Humanitas, București, 1998, p. 52.

¹⁴Vasile Chira, *Liber miscellaneus*, Editura ASTRA Museum, Sibiu, 2015, p.173.

¹⁵For the fear of God / theophobie see Ronald M. Doctor, Ada P. Kahn, and Christine Adamec, *The encyclopedia of phobias, fears, and anxieties*, 3rd ed., Facts On File, Inc., New York, 2008 p.253-254; vezi de asemenea Goldstein, Joel, *The Infinite Way*, San Gabriel, CA: Willing, 1947; Hill, Douglas and Pat Williams, *The Supernatural*, New York: Hawthorne, 1965, pp. 28-68; Sandmel, Samuel, *A Little Book on Religion (For People Who Are Not Religious)*, Chambersburg, PA: Wilson Books, 1975, pp. 46-54; Spinks, G. Stephens, *Psychology and Religion*, Boston: Beacon Press, 1963, pp. 1-13, 31-46, 117-146; Thomas, Keith, *Religion and the Decline of Magic* (New York: Scribner, 1971), pp. 51-112.

invoked by the prophets of the Old Testament.

Theophobia can take several forms, from an exaggerated fear of the gods' revenge for the sins committed, to repulsion, avoidance, disgust to God, saints, religious rituals, cult objects or prayers, etc. This form of positive phobia related to Divinity is extremely frequent among the religious adepts and practitioners. The theophobic type of believer cannot live a single moment without being in an intimate, dialogical, ritual relation with God.

On the other hand, the term 'theophobia' is not a very proper one, as phobia in general supposes an avoidance of the anxiogenic object or phenomenon, whereas in the case of theophobia, we speak of acceptance and love of God, fear being only induced by its manifestations. In other words, in the case of fear of sin and of the divine punishment we could speak of a positive theophobia, whereas in the case of the atheist, who develops a fear of the name of God and of any symbolic, iconographic, representation, manifesting antipathy, disgust of anything which could suggest Divinity and the guilt related to it, of a negative theophobia. There could also be the possibility of the use of the concept of theophobia only for the fear of everything related to God, while for the fear of sin and of God's punishment such words as hamartanophobia (fear of sin) and theocrinophobia (fear of judgement) could be used.

Symmetrically, there could also be ktiseophobia (God's fear of His own creation), cosmophobia (God's fear of the world created), hyophobia (God's fear of His own sons). The level of decay that the world has reached, organized crime, drugs, fratricidal wars, pan-terrorism, biological weapons, fatal diseases, exacerbated sexuality, the human genome manipulation, trans-humanism, technological singularity are enough reasons to trigger such an attitude from a personal Divinity which is good, loving, and just, as most of the religions consider It. Traces of divine regret for having brought humans into being are to be found even in the first part of the Bible: "The Lord saw how great the wickedness of the human race had become on the earth, and that every inclination of the thoughts of the human heart was only evil all the time. 6 The Lord regretted that he had made human beings on the earth, and his heart was deeply troubled." 7 So the Lord said, "I will wipe from the face of the earth the human race I have created—and with them the animals, the birds and the creatures that move along the ground—for I regret that I have made them." (Genesis 6, 5-7)

17.6 Divine Antropophobia

Theophobia is mediated on one hand by our relation with other humans, and on the other hand by our relation with Divinity, for our existence is an associative one.

If humans have fear of God, symmetrically, there is a fear that Divinity has of humans, but also there is God's fear of His own ipseity (theoautophobia), of His condition of *actus purus*, by which He could generate other layers of existence - angelic, eonic, human. But the greatest fear of God of His own sineity is connected with His own omnipotence within which He could create other Gods, beings which are His equals, or even superior. In this case, as Lucian Blaga suggests influenced by cosmogonic myths, an ontological anarchy could be reached. The war for supremacy between these equal gods would become inevitable, theomachia would be an unescapable possibility. From profound ontological reasons, to save the centralism of existence, The Great Anonymous (Marele Anonim) decides to self-censure His cre-

ative powers at maximum.¹⁶

But getting back to the divine anthropophobia which we could name hyophobia (fear of the son), God has a fear of unpredictable, reprovable deeds that His creatures could do by virtue of the freedom that He endowed them with.¹⁷ Such deeds, should - logically speaking- surprise Him, because if He had known them in advance, this would annihilate any trace of freedom. Of course, theologians and philosophers which want to save at any rate the elective freedom of humans, would say that our immanent temporal categories do not apply to God, that His omniscience does not take place in time, but outside of temporality. Such an objection seems legitimate at first sight, but we shouldn't forget that His eternity includes also the moments of our existence. We cannot be in His exteriority, as such an ontological autonomy would limit His infinity, but we cannot be in His interior either, because our evanescence would, this way, deny the absolute regime. Most probably, God includes us in His infinite pouch as something simultaneously interior and exterior.

The basic question is this: How does God relate with our fear? If we think about the fact that any knowledge supposes sufferance, it is obvious that God's knowing of our anguishes implies a dose of theopathy. Knowing our fears, God has also fears at the same time with us, suffering along with us, as the two subjectivities, God and human cannot meet in an exterior term. God feels in His subjectivity our subjectivity. In other words, any phobia, beginning with ofidophobia to thanatophobia is assumed by the divine consciousness as well. Why did He create such a frightful, vulnerable being, that he be constrained to suffer with it? Here is one of the questions that neither theology, nor philosophy or sciences could satisfactorily answer.

17.7 Symptoms of Theophobia

If the symptoms of theophobia are present at some subjects all the time, at other theophobes, the symptoms are only triggered by certain stimuli: a worship place, ethical dilemmas, conversations about religious themes, etc.

We may either speak of theophobic forms which imply the acceptance, the acknowledgement of divinity and the exaggerated fear of it, or we may speak of God's refusal and the phobic relation to any idea, thing, symbol, theory, cult, ritual, gesture, name which refers to such a transcendental entity, the symptoms are the same. Besides, any of the 6000 phobias described by psycho-pathologists develop a symptomatic picture which includes physiological disorders (cardiac rhythm increase, accelerated breathing, tremor, sweating, muscle weakness, feeling sick, nausea, suffocation, intense anxiety, panic attack, dizziness, palpitations, vomiting, dry mouth, momentary inability to speak, crying accesses, frequent urination), of a subjective nature (personal experiences, thoughts which the patient feels in the moment of confrontation with the phobogene object, statuses that differ from a subject to another), of a behavioral nature (lack of proper reactions, stupor, stillness, avoidance, escape, panic, nervous arousal, rage).

¹⁶See Vasile Chira , *Studii de Inter-, Pluri- și Transdisciplinaritate*, Editura ASTRA Museum, Sibiu, 2012, p.129.

¹⁷In the parable of the *Prodigal Son* ,the Father is not only concerned not to see His son's material and spiritual failure, but also with his (not) coming back.

17.8 Causes of Theophobia

The research of the latest decades have managed to identify the major causes of phobia. The adepts of behavioral theory, for instance, assert that, irrespective of typology (social, specific, or agoraphobia), phobias are frequently caused by learning: conditional learning, vicarious learning, and passing of fear-provoking information (Rachman, 1990). Other researchers think that phobia is triggered by a combination of factors: behavioral influences, environmental influences, biological and genetic predispositions. Also, the dysfunctions of the nervous system can constitute a favourable medium for the development of a phobic behavior.¹⁸

Similarly to other types of phobia, theophobia has its origins in the unconscious. Certain anguishing experiences from the childhood, the inoculation of fear of sin and the idea of divine punitiveness in childhood, the death of a relative or of a friend, lover, failures, watching some movies, reading, the news in the media, etc. can become catalysts for certain forms of theophobia. Even if the causes of phobia are not sufficiently known yet, psychologists and psychiatrists think that certain traumatic events are triggers for this disorder, which add to some hereditary, genetic predispositions.

17.9 The Metaphysical etiology of the Phobic Behavior

The causes of phobia essentially remain unknown. The technologies of the abyssal itselfness the mechanisms of protection of the subconscious, the biologic inheritance, the learning of the phobic behavior, relating of some moments of intense fear with one object, being, or situation, etc. are a few of the theories that try to explain this phenomenon.

It is true, we cannot minimize the role that biology, neuro transmitters, genetic predispositions, family history, learning, unconscious associations have, but, in our opinion, some more profound causes of phobia should be looked for in much more profound zones.

The postmodern human cannot ignore his own history, his own biologic and spiritual genetics, the real reality, the archetypal reality, the symbolic reality, the levels of conscience that he went through.

One of the major causes of phobia is connected with the fear of the indeterminacy of the ultimate meaning, indeterminacy filled with religious, revelational, cultic contents throughout history. All religions feed the mental of the child with an imaginary mythical flux, miraculous, with a perfect, magic world, lost by our ancestors due to the infringement of the divine imperative against the background of an alleged conflict between two opposed transcendental forces. The discrepancy between the fairy imaginary world and the phenomenal world subject to cangrene, dissolution, violence, maculation, disease, and death creates an inner conflict, a diffuse anxiety, against which all the types of phobia are grafted, from nictophobia (fear of darkness), to astraphobia (fear of lightning) or algophobia (fear of pain). Such a theory might be reproached a lack of justification of phobias at newborn in desacralized backgrounds, in atheistic families, which were not the victims of such

¹⁸See Irena Milosevic and Randi E. McCabe, Editors, op.cit., p.289-293.

indoctrination. This counterargument does not work as long as there is a quantic genetics, an invisible genome, endowed with all the accumulations of the species from the primitive period up to the present. On the contrary, once the ontological, archetypal source is lost (be it real or imaginary), there is a transfer of authority at an unconscious level, a reversed respect, a fear that gradually takes the shape of a phobia. In fact, all the phobias, compulsions send us to a background which is radically different from the object, being, status, concrete situation which triggers the fear. The same abyssal mechanisms that are connected with the physiology of the unconsciousness are present in the case of addiction.¹⁹

Another cause of phobias is connected with our precarious ontological condition, with the absurd and the ultimate nonsense of life. In other words, not the human is phobic, but nature, being, diseases, death are anxiogenic by their own status. The consciousness of the fact of being, the inconsistency of beings and of things, the thanatotic horizon, the uncertainties connected with the metaphysical apparition and finality of life, the condition of a mammal with consciousness, the hostility of nature, of cosmic phenomena, thousands of diseases, the suffering, the lack of a metaphysical identity of humans, the violence of our fellows, the market of religions and gods, the antagonism of the tens of thousands of religious offers, the axiological and ethical relativism are the ones that turn the hypersensitive individual, with a minimum of operative and emotional intelligence into a sensor of the ontological evil, into a victim of phobias.

17.10 Conclusions

The objective major cause of theophobia is the religious doctrine according to which, at the origin of the universe, there is a personal, punitive, vengeful, etc. creator.

In the context of the existence of more than 30.000 religions (confessions, sects, denominations, orders, fractions, and factions) and each of them claim to be the only one that holds the truth, we can no longer speak but of a religious phenomenon, not of a particular religion. We cannot speak but of revelational models, cosmological religious models (cosmogonies, theogonies, and anthropogonies), soteriological models, theodicea models, religious ethics models, eschatological models, anastaseological models, etc. In other words we can do nothing but an archetypal comparative theology. In fact, this is the real theology, a scientific, objective, common sense theology.

An honest intellectual cannot deny an ultimate intelligent reality, which is responsible for the cosmic project. We cannot speak of a form of atheism related to a possible transcosmic intelligent agent, that generated reality. It is true, this agent can be of a quantic nature, can be an energetic field, can be an ultimate particle. From this perspective, all the religious activities, from hymns to dogmatic and ethical systems, from rites to rituals, are rather connected to poetry, to creation, to cultural identity. In the case of religions, we cannot speak of an objective knowledge, but about a naive mythical-symbolic discourse, culturally and aesthetically interesting, but metaphysically less relevant.

A thorough knowledge of ancient mythology, of the history of religions, of the archaic theogonies, of religious phenomenology, of the archetypal psychology, of cultural anthropology, of philosophy and of science keeps us safe from the idea of a

¹⁹See Vasile Chira, *The metaphysics of addiction*, European Journal of Science and Theology, February 2013, Vol.9, Supplement 1, 22-25.

celestial ontological dictatorship , and also from the fear that such a divine anthropomorphized spectre inspires.

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CHAPTER 18

Framing Commons for Society-Technology for Electric Infrastructure Supply Systems

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This work discusses the dosage of technological systems for infrastructure arrangements and how the concept of commons-based presumption could be integrated into energy systems and associated transition processes and agency from the bottom up. We span up conceptual tensions across the range of individual and collective interests, namely along the lines of sovereignty and solidarity. To highlight caveats for the use of technologies across different subsections of human societies we suggest ecosystem theory as an extension to other frameworks. We apply those insights to a framing of commons at the interface between technology and society for the socio-technical system of distributed electric energy provisioning. The energy co-prosumer, a fictive character, who would be an agent to help build the common pool resources logic for society-technology is presented. We show that technology as a tool can enable and assist to achieve transformational change and introduce the commons-based co-prosumer instead of the individual-based prosumer. These concepts help discern role, rule and control systems for operational as well as system design aspects of sustainable energy transitions and how these can fit together to mould transformational changes from a systems perspective.

Keywords: energy co-prosumer, governance, control systems, self-determination, socio-technical system.

18.1 Introduction

Sustainability transitions aim to (re-)design structures and possible pathways towards scenarios that are more inclusive socially and more responsible with respect to surrounding ecosystems. Environmental and human systems are to co-exist in balance both from local and global perspectives as well as over time considering future generations. The aim should be towards more sustainable and resilient systems and one pathway to achieve them could incorporate addressing challenges by sharing responsibilities given the increased number of options through technologies.

We provide caveats for guidance at the interface of social-ecological and socio-technical systems by investigating the role of innovation. This we frame by differentiating social innovations and roles on the one hand and technological innovations and rules for socio-technical governance on the other; also their mutual intersections as well as their possible (in)direct interactions with and ramifications onto ecological systems. A frame for society-technology interactions under the concept of commons or common pool resources (CPR) is developed. We do so across the tension of solidarity and sovereignty using the example of a co-prosumer in an electric energy infrastructure supply system.

According to [1], the last century brought with it a new invention on innovation processes, namely, the belief that everything that can be done, should be done. This is relevant for the employment of individual people as well as of collective institutions in society enabled by technology infusion because a questioning about which range of potential options should be employed is important from an ethical and moral philosophy point of view. Based on insights about options for the interaction of society with technology, we conjecture how to frame lessons onto current debates about the involvement of cyber-physical systems into everyday life (distributed view) and onto their governance (aggregate view).

We discuss technology involvement in human affairs through a lens on its virtual interrelations for domestic electricity control systems. The goal being to find reasonable, dignified, and integral ways for the weaving of technology tools into more sustainably-designed societies. We critically reflect on the use of technologies by spanning the range of possible options in the dichotomy between empowered consumers that are given choices and the empowerment or disempowerment of prosumers through the submission to control systems that may or may not serve other interests. Which processes and socio-technical arrangements are more conducive to reaching a sort of energy sovereignty on the consumer level will be discussed.

System complexity increases with more players and interaction options in the re-design of those systems. Some visions and implementations on how to shape greener futures could be characterised as utopian. The shape this can take is across a range of collective control mechanisms versus authoritarian governance, which are discussed in [2] from a degrowth perspective of enabling and convivial technology futures and their opposites. Hereby, a utopia is not an impossible mental construct but rather something out of the ordinary, elsewhere, or in the future – a vision on the possible range of how societies should be de- and reconstructed, structured and operated and how resources are to be employed and distributed [3,4].

Solidarity as a concept is perceivable somewhat indirectly and intangibly. To assess its presence, it might be helpful to deliberate on options for reciprocal and non-monetary and material exchange systems. Our investigation asks how to conceptualise the contributions of factors that can be steered behaviourally across the individual and collective realm. What are the consequences and effects of different system framings and how are they affected by the different levels of understanding and perspectives that come together in more diverse and aiming-to-be equitable and just system designs?

We ask how formalised rule systems emerge and could be shaped, as is one focus of institutional analysis and which can be assisted by political economy. We investigate what system representations with their underlying assumptions on power, information and control structures exist and which questions should be posed about the design of social interactions and how to link them with technologies.

The concept of an electricity co-prosumer, who would become freer by having less choices related to the manner of the relatively indifferntiable aspects of electricity consumption. This could be achieved through a once-off choice or a contractual arrangement, respecting the aim to achieve a balance across individual and collective interests, namely solidarity. This reflects our aim for a discussion about the circumstances and socio-technical arrangements that are necessary for any type of decentralised control, be it financial, technological, social, or legal. For the energy co-prosumption (ECP) frame, the level of aggregation in that different shapes of collective processes are enabled is important and has been developed in the Interrelations Between Agency and Structure in Transitions (IBAST) framework of [5].

This article is structured as follows. After a short overview of concepts relevant for electricity consumption from common pool resources according to Ostrom and their operationalisation with technology through algorithmic governance, we discuss relevant aspects from social practice theory [6, 7, 8, 9] for home energy management systems. Thereafter, we navigate from the interface of society-technology to technology-society by referring to technical and social interconnectedness according to [10]. From those options arises a discussion on the co-provision and co-creation of infrastructures as such and their modes of operation. We end with an overview of the types of interrelations that could be made possible across human and technological option spaces. In this, we suggest the ecosystem approach as a classification for redesigning or moulding the types of relations that are possible in socio-technical arrangements for electricity. We argue for their reframing based on commons for a commons-based (co-) prosumer instead of the popular persona of the more individualistically orientated prosumer.

18.2 Literature review

18.2.1 Commons and society-technology context

To imagine the case application of the abstract concepts to be discussed here, take a local neighbourhood, in which people are deciding on the installation and operation of their water or electricity systems. These could include rainwater harvesting, greywater recycling, or the sharing of solar photovoltaics plus battery systems. The question we address with the concepts developed in this paper is what the rules of the game should be for the attribution of benefits and the distribution of relative costs. While these have been tested synthetically and practically using agent-based models or serious games, our approach fits more onto a meta-level for system design options and operational aspects such as rule and control systems, augmented by technological possibilities. For the exemplary case, how and whether to rank, rate and trace the relative contributions of the individual components of this energy neighbourhood system would need to be decided. This decision in turn determines the level of permeation of technological and ICT components to enable the system to be operated and controlled respecting shared interests. The level of self-control or outsourced control needs to be carefully considered and depends on the internal proficiency or available professionalism and the desired levels of aggregation across the structures of a community energy system.

Whenever supply infrastructures are shared, the monitoring of differing relative contributions to demand and supply becomes a topic of collective decision-making and with this, several possible exchange systems could be taken as a basis. Thinkable

options for valuations of these exchanges could be egalitarian, flat rates, or more or less tracing and monitoring of production and use data, which might require data storage. If no equal accounting system is used, a reciprocal exchange system requires accounting systems and bureaucracy, even if simple recipes are used in the system. These aspects concern questions on the reciprocity and traceability in system governance. It is relevant to decide upon how much data is collected and what meanings would be attributed to this data.

The idea of commons or CPRs originated in natural resource systems that were extensively studied by Ostrom, who reached beyond what market and governmental approaches can offer. Her work evaluated the conditions for sustainable management of CPRs, collecting already existing alternatives to top-down approaches to governance. Despite this approach, Ostrom should not be seen as a “poster child for anti-market economists” (Philip Booth in [11], 13). She does away with the limited perspectives of textbook theorists by exposing the rich sphere of options that people in their own context come up with to solve adaptive co-management and governance issues of the resource bases that they themselves depend on. Institutions to support those self-developed processes are necessary to upkeep not only a balance, but also checks and balances in the form of rule, monitoring and retribution systems.

While Ostrom developed and applied these principles on natural resource systems, more and more voices are emerging that are interpreting technical and socio-technical infrastructure systems as a CPR that is being shared and in need to be appropriately governed. Applying the principles and lessons that can be gained from CPRs and to some extent the design principles onto the new and old players of electric infrastructure systems, Pitt and Diaconescu (in: [12]) encoded the design principles of CPRs into a frame of algorithmic governance of common pool resources. They employ adaptive institutions, distributive justice and the canon of legitimate claims onto several examples, one of them being decentralised community energy management systems. For this, holonic structures have been deliberated to be useful. ([13] in: [12]; [14])

For collective action situations, [15] address information asymmetries and other risks that can arise in self-governed socio-technical systems through digital rule sets of Ostrom from a knowledge management strategic perspective. They achieve a fair distribution of power, aim for transparency, inclusivity and shared values also in heterogeneous collectives.

18.2.2 Reframing connection options and rule systems for technology-society

Technologies can carry out functions such as monitoring, mapping and tracing with associated possibilities for the control of processes. Increased socio-technical connections bear the risk and potential for a greater emphasis on individuality and separateness, while at the same time commons-based systems can develop individual as well as collective interests and support a more balanced distribution of costs and efforts. This permits a continuous growth of networks and new dependence relations based on which new agencies can arise for self-determination, governance, emancipation, and empowerment. For this, filter systems that curb, channel or catalyse the information that is being collected, shared, and used could be useful to steer sensible collective efforts with intentionality and direction towards common aims and mutual learning from the bottom up.

We suggest investigating the role of technologies in a digitalised society for building, maintaining and discarding of connections. The definition of roles and responsibilities is affected by boundaries both locally and virtually. Agency on individual and collective scales can be represented in holonic structures and across levels of aggregation, and with this under an umbrella of collectivism. With increasing importance and permeation of technology, option spaces increase for access to and processing of information, and responsibilities are thus augmented. These possibilities require a framing from different perspectives such that technologies can be inclusive, such that socio-technical systems are more enabling rather than overwhelming or disempowering, and such that sustainability aspects can be improved in socio-technical systems and the other systems they influence or interact with.

The ways in which a technology affects a social system, an economic system, or a supply and value chain can be distinguished according to several criteria (adapted from [16]). Technologies acting as obstacles (solidifying states of separateness and disorientation) are to be avoided, and the design of socio-technical systems is not to nurture self-centeredness but rather the collective good, not steering towards dehumanisation. Furthermore, technologies are to help incentivise behaviours towards sustainability and to investigate different modes of human-machine interaction. In this, limiting the interactions and exchange systems can not only simplify infrastructure arrangements but also can, seemingly contradictory, endow human actors with some freedom precisely through inhibitions or limitations. On top of this, with appropriate designs of rules and mechanisms, fairer attributions and contributions can be enabled, appreciated and if appropriate also monetised and its benefits distributed. There is a need for limiting the use of technology instruments or tools to avoid potentially unnecessary intermingling in the social, virtual and physical spheres.

In her critique of the smart utopian vision, [8] refers to the Golem from Jewish mythology and functionally compares it to the concept of home automation technologies. This figure is similar to a slave helping around the house. The question on who controls or adapts to whom, and how instrumentalisation is taking place with technology is relevant for such an intrusion into everyday domestic practice. Similarly, in German folklore, the Cologne *Heinzelmännchen* are assistants or servants to people, cleaning up overnight but disappearing if they are being watched (monitored). The lesson of the allegory of such supposed helpers for home energy management systems is that these systems are not merely passive and indeterminate to human behaviour for energy consumption, but rather they “are enrolled in a dynamic interplay between who or what is in control that has implications for when, how and how much energy is consumed” [7, 8]. Thus, the ownership of data and rights around information exchange, self-determination, as well as control aspects trigger questions such as: When are technologies enabling or disabling? Should the ‘smart ontology’ of the industry especially with respect to changing demand patterns be questioned? [17] How can technologies assist in operationalising CPRs for the coordination of bottom-up and decentral energy transition processes? What are implications onto the behaviour, intentions, and valuations of energy systems, such as adaptation and demand response or flexibilisation.

To dissect the dimensions relevant for technology-society interactions, the understanding of technology also as a political phenomenon implies that the distribution of burdens and benefits in the form of externalities is critical to consider. Externalities can occur either across social actors, across regions or time shifts and crossing gener-

ations. Hence, mechanisms to orchestrate involved processes towards more just and appropriate or considerate arrangements need to take place not only across different spatial and temporal scales, but also alongside levels of social aggregation, be it a neighbourhood, village, city or province.

Designing rule and governance systems should include a critical assessment of the real empowerment of people through technology. A trap could lie in the unnecessary shifting of responsibilities when social and technical dependencies are reconfigured. Agency and responsibility allocation are discussed by [18] and applied to a new role system onto energy citizenship or even sovereignty. The crossing of levels of agency is also positioned in relation to similar research on the co-emergence of new structures by the extension of mere individual consumer agencies away from merely end use or interaction with a smart home environment, to involvement in cooperative structures and thus collective empowerment.

Examples of how transparency is created of monetary control flows in the energy landscape are the German StromDAO, who enable bottom-up partaking of individuals. Compared to them, the Bürgerwerke are a conglomerate of energy transition cooperatives, bundling opportunities and working with intermediaries for direct marketing of electricity. For the operations of StromDAO as well as the aggregated energy coop to work, virtual processes as well as ICT are necessary. How much coordination is necessary and what happens on individual and collective scales and how to encode these into contractual arrangements affects sovereignty, dominance and self-determination. How sociality and the interactions between human-environment and technology are affected by information sharing and access to information with associated risks of abuse are critical questions, as evaluated in a case study from the U.K. by [19]. If we were to use the terminology of [18] onto those two examples; while StromDAO enables participation of emancipated consumers on market and financing of electricity, the Bürgerwerke additionally enable active citizenship on a more collective scale and with this also agency in terms of policy and politics.

The types of social and technical interconnectedness, and thus the relations of sub-compartments to the whole system, were categorised by [10]. The degrees of technical and social (dis)connectedness affect the level of self-sufficiency that is required, with one extreme case being off-grid technologies. On the other hand, high-tech solutions are needed for technically as well as socially highly connected system designs. In the old energy infrastructure system, which we are transitioning away from, there were captive consumers, monopolist providers, and non-renewable resources. The traditional utility relationship between individual customer was broken through deregulation and liberalisation of the industry. Through this emerged a disparity in size of players that interact for production and consumption and a differentiation of resource use, providers, mediating technologies and consumer roles.

More opportunities arise for co-provision given the new players, role and rule systems [20], thus transforming the captive consumer into a customer-consumer, citizen-consumer, or even co-provider. The range here is across increasing levels of self- and co-determination comparable to political maturity, in German Mündigkeit, which refers to having a voice in the sense of real or operationalisable agency in a given context. As co-designers and co-creators of value, the boundaries are flexed. The option space is widened about what is socially versus what is technologically negotiable or even acceptable. We ask how those two spheres could interact and which relational types could characterise the interactions. The new relations and exchange options that Finnish prosumers have were described by [21] and participatory

methods for better understanding the potential behaviour were suggested. However, if such prosumer roles are framed within a co-prosumer angle, this has implications onto the system logic and coherence and consequences for how individual and collective benefits could be dissected and woven together again. In the next section, the system structures and fitting in of the co-prosumer role are presented.

18.3 Governance and structural options in infrastructure systems

18.3.1 System structure, aggregation levels and relational options

If we start from an individual unit, autarchic in the most extreme case, and go step by step through several layers of aggregation, it implies that relations become necessary. The first type of a technologically and socially disconnected individual unit would be an off-gridder (for examples see the book review of [22]). In this scenario, one takes utility services into one's own hands at the smallest scale of provision and with theoretically no need to interact once systems are installed and assuming one can self-maintain them. A scenario setting, where one would have the choice to connect, but decided to stay secluded from a surrounding existing infrastructure system, could be termed dissociative and de-solidarising due to associated individual and collective consequences. Supply is achieved from own resources and the price of self-sufficiency is either scarcity and supply interruptions or a high level of redundancy and thus luxury and significant investment required to provide ample storage systems to make sure one does not 'run out'. The question for this individualistic setting is whether every person would actually feel empowered and satisfied to be this freely self-responsible, if really one is able to create and maintain such a system given associated necessary infrastructures and capabilities.

If we go further into connected systems, dependence structures are immediately occurring and control and information flows that come with such systems require decisions about causality and determination. Contractual arrangements providing a suitably crafted service arrangement or pre-designed systems of provision for electricity or other infrastructures determine the level of technology involvement and the ways in which these are realised and their scales of management. Depending on the setting of boundaries, subsystems or elements are in- or excluded, affecting externalities. Those relate to the distribution and shifting of benefits and burdens. Another way to represent the system structure for electric systems is a cellular design, for which open questions need to be ascertained about how to design local or decentralised markets amongst individuals, peers, or aggregations thereof in sub-compartments of the system.

We abstract this onto the interrelationships of technology and society. Given the potentially hazardous dependence structures that can occur in technology lock-in situations, it is reasonable to question the net benefits of the smart ontology by asking: Just because we can do something, should we really? Data collection, storage, sharing and controlling of information in critical infrastructures goes well beyond mere privacy issues. The question of what an appropriate choice is on an individual as well as collective level is non-trivial to answer for critical infrastructures and dependent on one's system's physical and social boundaries as well as mental

frames.

18.3.2 Fitting the co-prosumer role within ecosystem theoretic boundaries

Coming to electricity systems for domestic practice, an invented persona - in a way an antagonist of our co-prosumer – described by Strengers [9] and taken up by [23] is the so-called *resource man*, an individualist and engineer-type white collar male, who rejoices in having control at his fingertips. He indeed is and would be the ideal agent for the smart industry narrative because he could be a textbook prosumer, remote controlling his home and appreciating home energy management systems' connectivist functionalities. In [8], this smart utopian vision is questioned from several angles in her investigation of the negotiability or non-negotiability of domestic practices.

She frames social practices and implications for electrical and energy infrastructure systems, and identified a “need to extend the ontological realities in which smart technologies and their associated strategies are imagined and work” [8, 9]. While there is no one way in which this occurs, multiple realities can and do exist in the interrelationships between technology and society. A co-prosumer would fit better into the vision of [10], where infrastructure service provision involves “distributed generation, network integration and co-provision.” [10] (pp. 110-111) Thus, the concept of shared as well as co-responsibilities has already been framed a while ago. These could become a reality on wider scales, supported by technology options that are more and more permeating societies.

Sketching a frame for interconnection options for the ways that actors in the system relate to each other, ecosystem theory and theoretical ecology can be made useful. We suggest its use such that one can reach beyond descriptive metaphors such as the energy cells (sub-systems or compartments) or the cellular approach that is oft-discussed in Germany [24]. Another parallel from ecology are symbiotic relationships mentioned by [5] to describe collaborative interaction between energy cooperatives in Germany. The types of interconnection options across socio-technical contexts and different preconditions and scale economics across hierarchical levels should be critically examined. Using ecology concepts for sustainability agendas, [25] (p. 77) suggest that it is “important that two or more hierarchical levels are cooperating, not the higher level controlling the lower levels, as it is sometimes the case in management hierarchy. Control – instead of cooperation – always gives occasion to an increased bureaucracy, which wastes human and material resources.”

The label of a co-prosumer has been mentioned in an innovation and business management context by [26]. Other terms used by [26] and [27] include co-innovator, co-designer and co-creator of value. While for [26], the role of the consumer and extension of this role as a producer seems to imply not much more than common responsibility shared among a company and a prosumer, the prefix co- does not relate to Ostrom-style commons logic. Our suggested co-prosumer not only refers to the CPR approach, but also to commons-based peer production and co-creations across wider levels. These are also debated for electricity innovation management by [28], who go further to elaborate on the intrinsic and extrinsic motivations of active participants in innovation ecosystems. Top-down and bottom up processes in innovation diffusion for smart grid infrastructures are distinguished by [29], highlighting the importance of larger societal and regulatory factors that affect the success of co-

creative and prosumer roles. For the engagement of consumers for electric demand response programmes, [30] discuss power aspects, access to and control of information, regulation and the role of and options available to intermediaries. Independent dispute resolution mechanisms are required besides appropriate contracts that map the envisioned new role and rule systems.

From a technology and commons-based perspective for an open source society, [31] revisits the tragedy of the (uncontrolled) commons and transfers these principles onto technology-intensive infrastructure systems. Regulation seems to be called for to avoid the complete collapse of functionality of a CPR such as the mobile telephone network. To the role of politics, privatisation, auctioning and regulation he adds what he calls a missing link provided by Ostrom-style CPR governance, including clear boundaries, the possibility to change rules, and collective monitoring and retribution mechanisms. The internet is taken as an example of a highly complex CPR of knowledge for the digital information economy. Digitalia mostly are not characterised by rivalry and are part of a “*magic cooking pot*” of knowledge commons. The copyleft principle and commons-based peer production are part of the open source movement that created a culture of collaboration that incorporates open designs and blueprints that are able to help stir open innovations. The shadow side of these new possibilities are challenges of intellectual property and digital rights management, where control mechanisms that were originally intended to incentivise innovation have now turned to become a method of top-down control.

Concepts around top-down and bottom-up control systems spanning several disciplines were discussed by [32]. Inferring from the mere translated meaning of the word hierarchy, he juxtaposes different interpretations of control types and system structures across biological ecology, sociology, social ecology and political theory such as antihierarchic revolutionary interpretations. Ethical constraints and terminology are applied to nested power relationships and ruler and ruled relations. Taking a stance based on systems theory, [33] progressed work based on [34], who in turn suggested a way to navigate between holistic and reductionistic perspectives. In this, he used the concept of a holon to define a structure as *Self-regulating Open Hierarchic Order*, or SOHO. This acronym was referred to by [32] as Self-Organising, Holonically nested, and Open (SOHO) entities or beings.

SOHO conceptually refers to structural aspects about subsystems, their relative autonomy and authority, rule systems and strategies of evolution are described in terms of their negotiability, non-negotiability and flexibility across levels. Specific rules are associated with structural and functional aspects, concepts from ecology that can be transferred onto socio-technical systems alike. Koestler transfers these principles to behaviour in social contexts and ends with a canon, or a systematic set of axioms and propositions relating in detail to cross-level hierarchical structures [34].

For ecosystem theory to address socio-technical system structures, the parallel principles and characterisations of what a species entails would need to be described. The aims, intentions and degrees of freedom in the behaviours and the environments and contexts from which resources are used and shared can be more clearly distinguished in a human-made technical system. If we look at different types of networks that could play a role for the system design, options could include mutualistic, symbiotic, parasitic, predatory or facilitation, commensalism or mutualism types of relationships. These types affect who benefits how and on which level and whether components are able to survive in the short (small temporal scales), medium (life

span of organisms), or long term (evolution and species).

If we transfer this onto political economic questions across levels, interactions on individual and collective scales as well as on physical infrastructure systems need to be appropriately assessed to be able to be coordinated. With more system components and more versatile roles that can be played, there arise also more interaction possibilities. This increases the system complexity and thus finding appropriate coordination or rule systems becomes more challenging as system structures adapt to new technological functionalities. From formalised rule systems such as what is or could be encoded in legal systems, incentive systems can be designed that impact the directionality of causality, or determination and control in infrastructure systems.

18.4 Summary and discussion

Summarising, we aimed to strengthen sustainable and resilient systems by proposing options on how to realise co-responsibility for technology applications that invade the privacy of the household. Through this, at the same time we suggest hope as we propose to curb the full potential of permeation of technology options in infrastructure systems. Additionally, cautioning around innovation in sustainable societal transition processes by debating the (dis)enabling roles of technology for social solidarity were our points of focus. We provided arguments that are useful for cooperative and participatory approaches in infrastructure systems of provision with the focus on roles that can be played on individual levels or on peer-to-peer (P2P) networks. However, an ecosystem-theoretic approach that can represent structural and functional as well as different role and rule systems for interactions amongst system participants permits even more differentiations and the augmenting of the P2P concept into how subsystems (S), aggregations (P), or individuals (I) relate to the whole system. This can qualify the type of feedback loops that would then be schematically described as follows:

- P2S – S2P: How do peer structures and other subsystem structures interact amongst each other and with the whole system?
- I2S – S2I: How do individual subunits relate to subsystems components?

18.5 Conclusions and outlook

We suggested common pool resource logic as a basis for incentive systems that balance individual and collective burdens and benefits. In this context, energy co-prosumption (ECP) would be more appropriate to be incentivised instead of the potentially detrimental prosumer because looking at the repercussions that the latter induces to the system, benefits neither really arise for his own nor for the system sake if assessed from a more holistic system-level angle.

The energy co-prosumer could also be framed for other infrastructure supply systems and will need to be framed or embedded and considered within systemic structure options. Ultimately, it is desirable to reach an appropriate design of incentive systems that could go beyond a mere nudging of prosumers to become co-prosumers. We are not necessarily saying that all prosumers must or should be co-prosumers, but, we wish to establish in more detail in future the implications that more co-prosumers would imply across system levels, should this persona be nurtured. With

such a systemic view as we have proposed, it would be possible to create offers that are very difficult to resist and hence decisions and preferences on the individual level could be developing in a more commons-logic based fashion.

Control systems that could be based on a framing of the interactions across levels need to consider different options for determination. Determination in this case refers to self-determination on the one hand, and determination by and for others, referring to collective sub-structures. If the individual subunit views self-determination also as a part of a larger sub-structure, then the distribution of costs and benefits of system design and operation can be allocated accordingly and value would be seen in a different light. Voluntary contributions such as sufficiency or flexibility, which impose some smaller scale disadvantages but larger-scale advantages that feed back onto the smaller scales potentially with a time delay, could be seen in a more positive light, and thus, could gain some momentum.

Following the argument around the combination of hedonism and sufficiency [35], the concept of alternative hedonism could inspire the roles not only of the human agents in a socio-technical system, but also the role of technologies and digitalisation as such. The concept of alternative hedonism and consumption as a political tool was framed by [36]. The involvement, participation and use of smart energy systems and cooperative structures could equally well be an “act of political identification” [36]. It would be helpful for the adaptive and potentially even incrementally transformative redesign of a socio-technical system to reconsider the choices on individual and collective scales and their repercussions if aggregated. The success of the “hedonist imaginary” [36] is dependent on the “emergence and embrace of new modes of thinking about human pleasure and self-realisation”.

Intrinsic motivations coupled with pleasures in alternative pathways – frame a sort of appropriate technology and minimalism related to the potentials and hazards of technology-society interactions. This can impact the modes for meeting needs, and the modes of consumption. These, in turn could be transferred to modes of operation and assist to achieve sufficiency collectively. This can be realised with the aid of technology because potentials can be made visible faster and governed more appropriately.

Intentionality and as much as possible being aware of causalities in system design and operation and how these are affected by the purpose or role of technology integration are key points to consider. Given the extended toolset proposed by technology that we aimed to critically discuss and normatively align in this article, some questions arose that could be investigated in future. These involve questions around how values are assigned and the setting of aims for an individual or a collective. Furthermore, to ask what are the possibilities in infrastructure arrangements and what aspects need to be (re-)negotiated as well as co-assembled?

Positive examples at the science-technology interface are tools that can enable learning and system understanding in participatory processes [37] such as interactive mind mapping tools¹ or visualisation tools for determining the phases of human processes. Complex decision processes for self-organising processes are described and guided with a technological tool² by [38], developed for monitoring progress in psychotherapy.

The risks with leaking of sensitive data for vulnerable (medical patient) groups are to be carefully considered, given that the tool mentioned above was developed

¹<https://noduslabs.com>

²<https://www.ccsys.de>

just before massive data sharing technologies were permeating societies. Therefore, infrastructure systems should ask questions such as: benefits for whom, at the cost of what, and what could be side effects now and in future?

Coming back to the frame of responsible technology permeation through society and the need to accept or reject it in a differentiated manner, this work highlighted strategies for discerning the dosage of how a technology can be appropriate and in line with a socially robust purpose. Those enabling software tools help steer and trigger processes of high value to mental health and participatory design processes. Even though they require significant monitoring and transparency, despite their invasiveness their shared purpose and aligned consensual intentionality and potential results make them worthwhile in the appropriate context.

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CHAPTER 19

Transdisciplinary Theater for the Re-enchantment of the Being and the World

Domingo Adame, Veracruzana University, Mexico

In this communication I'm interested in answering the question about how the theatre that has transdisciplinarity as its support, can contribute to the "re-enchantment of the being and the world", for its quite clear that the theatrical model legitimated doesn't allow nowadays a satisfying relation with the complexity that constitutes the Subject. I will check, therefore, how the transdisciplinary principles of levels of reality, the included middle and complexity, as well as transdisciplinary attitude based on the conscious and cosmic verticality, can help giving the theatre a quality that, through the Hidden Third, allows the union between Subject and Object, meaning the "Re-enchantment of the being and the world". I'll reference the experiences that have affinity with this goal and I'll point out the characteristics of what I call Transtheatre.
Keywords: Theatre, re-enchantment, transtheatre, transdisciplinary methodology, Hidden Third.

19.1 Introduction

In my perception the relation that, as humanity, we have with the world and with ourselves reveals a deep disenchantment, because of it, with the naiveté of the child who still lives in me and with my theatrical academic experience of almost four decades, I ask if theatre can contribute to the re-enchantment of the being and of the world. If we observe the context in which we live and that has been clearly described by philosophers and artists, we hardly might be optimists. The challenge which we face, as well as Basarab Nicolescu indicated, is enormous: *Transhumanism*,¹

¹The technological singularity is the basic ground of what is called transhumanism, partly because the technological singularity is blind to human values. Let me make, based upon the transdisciplinary approach, some short considerations about transhumanism. If the transhumanist project will be achieved, human beings will become increasingly more a machine and the machine will become increasingly more human. Transhumans, which some philosophers and ideologists call them, for obvious oratorical precautions, improved humans or ameliorated humans, will constitute a new, bio- technological species. Future society will be divided between transhumans and old humans. In my opinion, the old humans will

*Anthropocene*² and *Panterrorism*³ [1].

Nevertheless, the creative potential and of conscience of our humankind can be superior to the destructive one, as long as we allow ourselves to flow with the reality. This way has made it by many scenic creators who, in their respective cultures, have generated proposals to face the disenchantment that produced the modernity and reached its apex in the postmodern era.

For that, in the same way which Bertolt Brecht proclaiming that the theatre of the 20th century would be that of the scientific age [3] –a theatre of the reason opposite of the theatre of the feelings– today, echoing from different voices, I affirm that theatre of the 21st century will be that of the transdisciplinary age, a theatre for the re-enchantment of the being and of the world, one strategy of creation that several artists and researchers have called *Transtheatre* indicating with it that is a practice based on the Transdisciplinary Methodology, and not an innovation founded in the same principles of the modern paradigm. Of course that does not eliminate other theatre practices.

19.1.1 Transdisciplinary Methodology and Theatre

The three axioms of the Transdisciplinary *methodo-logy*: Levels of reality, Logic of the Included Middle and Complexity, are the support of Transtheatre that finds its objective with the emergence of the Hidden Third.

Niculescu affirms that Transdisciplinary is a question of a strategy that allows the connection with the ordained movement of Reality [4]. In this way, Transdisciplinarity theatre could be in connection with the ordained movement of the Reality if is seen in a vertical perspective that conduces to the re-enchantment.

Theatre –the most ancient form of religion according to Mircea Eliade [5] – human expression where a person interacts with others while someone else observes them in a shared time and space, as our admired Peter Brook synthesized [6], can have different names in diverse cultures, modify the structure of its relations, to privilege one or others of his producers according to the epoch, and use or reject the technological available resources. But beyond all its variables, this practice is a real human space

inevitably be servants of the transhumans. In other way Clive Graham examines “transdisciplinary convergence” in the context of radical evolution and how the performing arts employ elements of genetics, robotics, information technology and nanotechnology (GRIN) for innovations to transform performance and say that “and hyper-reality performances attest to the emergent enhancement of human performance and the rise of the transhuman artist resulting from transdisciplinary convergence” (Clive Graham of the School of Creative and Performing Arts, CQUniversity Australia, speak about the Transdisciplinary convergence in the performing arts [2]).

²The word anthropocene is a neologism designating a new geological era, characterized by the fact that the actions of the human species become the dominant geophysical force of our planet as compared with natural geological forces. There is a danger today, for the first time in history, concerning the extinction of the entire human species. The survival of the human species is, for a good number of scientists and philosophers, the most important issue of our time. One thing is certain: In Anthropocene, the old and persistent radical distinction between nature and culture is no longer valid. Culture changes nature. Desecration (violation) of nature is thus reaching its peak (pinnacle).

³I introduce the neologism panterrorism to describe a new form of terrorism, without any real connection with a religion. Its aim is to kill the other in order to impose its own power. The panterrorism, more and more present on our planet, is replacing God with the human being. By killing the other, the desire of omnipotence reaches an unpredicted climax.

of research where Subject tests all the possibilities of being and enters in relation with the Object as we can see in *The Valley of Astonishment* (2014), written and directed by Peter Brook and Marie-Hélène Estienne. How has been this relation from the Premodernity to the Cosmodernity [7] and how have the enchantment, the disenchantment lived in such a way that now urges the re-enchantment?

19.2 Premodernity

The rite, notion that precedes theatre was generated in the antiquity, in an “enchanted world” of straight participation, where human beings were not observers detached from the cosmos, but active participants. The personal destiny was assumed attached to the world’s destiny and this relation sustained life itself [8].

According to Nicolás Núñez, creator of Anthropocosmic Theatre, the history of Western theatre until before the Scientific Revolution shows how theatre was alienated of the efficacy of the rite to approach entertainment and the presentation of emotional conflicts [9]. Thus, theatre history, is for this creator the history of the decline from the sacred to the profane.

19.3 Modernity

Starting from the postulates of modern science, the main theories and poetics of theatricality were created.

Martha Toriz points out: “From the nineteenth-century positivism that postulated that the scientific method wasn’t only applicable for nature sciences but also for the study of the human being in society, it was established in Germany on 1923 an institution of theatrical science” [10].

This means that the conception of knowledge, of reality and representation in the fields of the arts and theatre hasn’t been much different than sciences, since a paradigm is a way of thinking and acting that support all disciplines.

In the West, until the end of the nineteenth century, theatre was brought under literature. The hegemonic theatrical way was based on a dramatic text and it wasn’t until halfway of the twentieth century when other manifestations related with representation-action began gaining ground, with the goal of including, effectively, all kinds of scenic practices linked with the scientific and technological developments and not exclusively the enthroned one by the bourgeois theatre of the nineteenth century.

The theatrical studies were institutionalized in the twentieth century as a “theatrical science”, nevertheless, the paradigm that dominated the scientist knowledges since the beginning of modern science on the seventeenth century has been confronted by models, approaches and postulates that oppose to reductionism in order to be concordant with a universe where the inconsistencies, contradictions, antinomies and paradoxes exist.

The theatre of the modern age that, of course, reached extraordinary moments with emblematic figures was established based on binary logic, it is worthy to check Georges Banu’s profound and touching essay *Amour et Désamour du Théâtre* [11].

19.4 Posmodernity

Changes in the domain of art happen to be more difficult to assimilate by the receivers and the academic institution -whose objective is to preserve the fundamentals that keep all disciplines- than creators/investigator, that in order to overcome the old debate between, for example: literary theatre vs spectacular theatre, or the most recent: live theatre vs ritual theatre, as well as theatre vs performance, have had to change of reference system.

A breakthrough with modernity's paradigm made emerge "posdramatic theatre" that corresponds, just as Hans Thies Lehmann points out, to European theatre of the late twentieth century. It was meant to change from a lineal and successive perception to a simultaneous one. That search was directed to achieve language autonomy, autonomus theatricality, not "mimetic illusion" [12]. In posdramatic texts the question turned around to "which new possibilities of thinking and representation are rehearsed for the human subject" [13].

In the beginning of the twenty-first century, some positions appear and they affirm a change of paradigm in theatre studies, like Chiel Kattenbelt's, who sustains that contemporary culture has become a mediatic culture (not culture of mediation) and that contemporary artistic practices are more interdisciplinary each time.

In Posmodernity one can watch the mixture of spectacles, performances, digital arts, liquid theatricalities, post-theatre, postdramatic theatres, textralities. Summing up: Multi and interdisciplinary theatre.

A concept that emerges precisely from open places because of the multi and interdisciplinaryity is performance, used at first by the north American academy to distinguish the scenification act of the written play, which—in this context—is designated as theatre. In this sense Performance Studies impulsed by Richard Schechner have as foundation any kind of human representation. We're talking about a new paradigm that replaces the theatre understood as the representation of written dramas [14]. Richard Schechner, in a recent conference at the Mexico's theatre researcher congress asked the question how to perform in the twenty-first century? In a context that, he said, "seems to be dominated by war and violence in all spheres of life" his response was: "By proposing new ways of channeling creative energy towards the invention of new cultural and political imaginaries, Performance Studies present an alternative to totalitarian and colonialist ideologies. A new Fourth World of aesthetics is emerging, seeking social and cultural change through artistic expression. Examples of this collaborative art of resistance across national and cultural boundaries may be found in the work of several artists throughout the Americas" [15].

Schechner proposed a Manifesto of Fourth World Performance that has four axioms:

1. To perform is to explore, to play, to experiment with new relationships.
2. To perform is to cross borders. These borders are not only geographical, but emotional, ideological, political, and personal.
3. To perform is to engage in lifelong active study. To grasp every possibility as a script –something to be played with, interpreted, and reformed/remade.
4. To perform is to become someone else and yourself at the same time. To empathize, react, grow, and change.

In the proposal of the North American theoretician, one can find a relation between the characteristic elements of theatre with performance's, that is why Josette

Féral rather use the concept of Performative Theatre.

If there is an art that has been benefited of the achievements of the performance is theatre precisely, since it has adopted some of the founding elements that revolutionized gender: actor turned into a creator, the happening of a scenic action instead of its representation or an illusionist game, an spectacle focused not in a text, but in an image and action, calling the receptivity of the audience, of a of a nature essentially spectacular, or to the perception ways of technology. All these elements that print the theatrical scene a performativity and that nowadays have become very common in most of the western countries (particularly in the United States, Holland, Belgium, Germany, Italy and the United Kingdom), are the main characteristics of what I would call “performative theatre” [16].

19.5 Cosmodernity

Cosmodernity proposes a new conviviality, very different than that one that promotes the homogenization of life patterns and which the cultural agent are the mass-media, especially the television.

According to the Mesoamerican thinking, that remains alive despite any annihilation eagerness, it is more accessible to us to comprehend and assume what Cosmodernity means: that every entity in the universe is defined by its relation with other entities [17] allowing the human being to relate with the Hidden Third. Therefore, the ethic imperative of Cosmodernity is the union among everyone and with everything [18].

At the moment of fusing Subject and Object, the Hidden Third emerges and crosses all levels of reality and goes to the non-resistance zone, or more precisely to the Transreality, a place where knowledge and Being derive in comprehension.

In the first three phases (premodernity, modernity and postmodernity) there is no emergency of the Hidden Third, like there is in cosmodernity.

With the Nicolescu analysis, as fundamentals in what concern to the relation Subject/Object; and of Erika Fischer-Lichte, about “Re-enchantment of the world” [19], we will have that: in Premodern World, Subject is submerge in the Object (enchanted world): Reality is pre-disciplinary, it’s manifestation is the ritual; in the Modern World, Subject and Object are separates: (disenchanted world) Reality is disciplinary and its expression is Theatre in proper sense; meanwhile in Postmodernity, Subject predominate on Object (re- disenchanted World): Reality is post-disciplinary and its vehicle is Performance; Transdisciplinary age is Cosmodern because Subject and Object are linked by the Hidden Third (re-enchantment of the world): Reality is transdisciplinary, and its expression is Transtheatre.

Thus, this historical development reveals how theatre and performance puts distance from the ritual efficacy of the sacred falling towards the profane and mechanical, for that is necessary to return to the source—as Jerzy Grotowski wanted [20]—and enter in contact with the *pure energy*, that minds Re-enchantment of being and the world.

19.6 Central fundamentals of Transtheatre

Transtheatre can be defined as the actions that a person or group realize in a conscious way to answer a question that emerges from the deepest of his being or his community, as I said, is based on the three methodological axioms proposed by Nicolescu.

19.6.1 Levels of Reality

Transtheatre relates or better, transcend, Premodernity, Modernity and Postmodernity scenic practices so that allows producers and assistants to pass along different levels of reality taking conscience of their breath, attention and producing the biggest possible energy. The movement that can propitiate the re-enchantment through theatre is vertical, not horizontal; it is not reached in a same level of Reality, where we respond to the development of events in an inertial way.

19.6.2 Logic of the Included Middle

Transtheatre, through the logic of the Included Middle, that integrates the contradiction and allows the spirituality, seeks to join all that keeps us separated from ourselves, from others, from nature and from the cosmos. It admits the contradictions and surpasses the binarism, since it is with the participation of all, not with the exclusion, that could emerge the enclosing and fair world that the comprehension and the convivial promote. For example, the relation actor-spectator that can be exemplified as a (actor) b (spectator): according to classic logic (and classic theatre) a is a , therefore a can't be b and there is no third term that can be a and b at the time; in the logic of the Middle Third and in Transtheatre, instead, one proposes: and a and b (and actor and spectator) or nor a nor b (nor actor nor spectator).

19.6.3 Complexity

Complexity is present in all fields of knowledge correspondent to the old principle of universal interdependence, and its emergence, Nicolescu says, gave the *coups de grace* to the classical vision of the world [21].

Transtheatre has as foundation the complex epistemology principles pointed out by Edgar Morin [22] whose theories are the only compatible ones with the transdisciplinary values:

1. Dialogical: it allows maintaining a duality in the core of the unit. It associates two complementary and antagonist terms at once (order-disorder).
2. Organizational recursion: A recursive process is that one in which the products and the effects are, at the same time, cause and producers of that thing that produces them (society is produced by the interactions among individuals, but once produced it retroacts on the individuals and produces them). The recursive idea breaks the linear idea of cause/effect...
3. Hologramatic: Not only the part is within the everything, but the everything is within the part (vs Reductionism -the part- and holism-the everything-).

Transtheatre organizes itself by disintegrating itself, each participant is autonomous and dependent of others at once, one experiments freedom and at the same time one

recognizes being possessed by hidden forces, uncertainty is present: there is no absolute order.

Transtheatre is not “spectacle pure”, but a multiple dialog among disciplines, poetics and cultures. It is a question of actions managed by re-enchanted subjects by the humility, the innocence and the love, where the structure is auto-poetic and is beyond the rules and conventions of the mimetic representation.

19.7 The Hidden Third

Following Nicolescu I affirm that Transtheatre is a route to look for the unique thing that is worth a sorrow in this world: the Hidden Third.

When the Hidden Third appears all the levels of reality resound. A perpetual movement of energy appears in the shape of vibration, the experience of the present takes place.

Between inhaling and exhaling there appears the Hidden Third, term of interaction between the internal and external world. It is by means of the conscience of the breathing that can change our mentality.

Transtheatre is the theatre of the Sacred and of the infinitely conscious, just like Artaud, Grotowski, Brook, Valencia, Núñez visualized, as well as the Eastern millennial cultures and the ones from Mesoamerica.

The way of the interior knowledge is not tied to any religious or spiritual ideology, is a essential epistemic vigilance of the life and of knowing that it wakes little interest up in the majority of people, because it implies a work and a rigor that is not attractive in general, since we live in a utilitarian world with short vision.

Because of it Transdisciplinarity considers the “Sacred” to be a part of a new manner of being, where the reason is not excluded.

19.8 Others characteristics

19.8.1 Transcultural

Transtheatre is opened for all the differences. It's by means of the Hidden Third that propitiates the comprehension between languages and cultures. “It is the open totality of the human being that constitutes the place without place of that which crosses and transcends cultures” [23].

19.8.2 Ethics

Transtheatre, for being transdisciplinary, is the art of stretching bridges for a better comprehension between people and a better relation with nature. It implies an ethical attitude of opening and dialog, because of it, it can stretch bridges towards the physical, emotional and intellectual balance of the Subject to reconstruct, from the honesty and the commitment, those social, environmental, cultural and affective bows that place people in a plot of fundamental relations to understand and to promote its integral care.

19.8.3 Harmony between Feminine and Masculine Energies

The human institutions of the antiquity and of the modernity have the stamp of the androcentric and only from the Postmodern age the perspective of genre began to generate one fail, but its in the Cosmodernity where one tries to recognize the equality of genres. The androcentric considers the human being of masculine sex to be the center of the universe, the measure of all the things, the only observant valid of everything that happens in the world. This way, in very diverse social, cultural, academic, political spaces, etc., there prevails the masculine presence and the patriarchal vision, being evident a social frame of asymmetries and inequalities. This procedure forgets that the masculine is in the feminine and vice versa. So, Transtheatre seeks to end with the representations, images and speeches that the stereotypes of genre reaffirm co - constructing new statements between human beings.

19.8.4 Participative Event

Transtheatre does not try to re-enchant with the spectacular magnificence, nor on intellectual creation, but for its simplicity, honesty and humility of its events. With the zeal to contribute to the re-enchantment of the world it is necessary to recognize the existence of subtle and universal interconnections between all the events and levels of organization of the reality. Each event is unique and unrepeatable, because not remain attached to representations.

19.8.5 Transpoetic Creativity

According to the transdisciplinary principles it's possible to visualize a theatre for and to the creation and recreation of knowledge as to know sensitively that it provides to the existence of its more beautiful attributes and allows the comprehension of the world in its diverse realities. A theatre that allows the emergency of synergies that transforms the destructive fatality into creator destiny. "An aesthetic and also ethic act, the act of revelation of the poetic dimension of existence" [24]. I conceive Transtheatre as a celebration of the humanity, as a space of reconnection with everything living and as a manifestation of the surprising individual and collective creativity.

19.8.6 Transtheatre as Food

What food do we want to offer to our society? Only distraction and scattering, or an experience that favors the self-knowledge and the interior expansion?

Transtheatre tries to re-enchant transform into food of the first quality for the spirit. "A theatrical event without concessions would be a delicious piece of manna offered by their officiates, it provokes the internal flight and the expansion of the conscience" as Nicolás Núñez say [25]. Transtheatre is made for giving food, for the soul, for the spirit, for spiritual life.

19.8.7 Conscience of Being Universe

Transtheatre is a theatre of transdisciplinary fusion that allows us to discover integrated, assembled with the universe. The theatre promoter of the consumerism is

a theatre that fissions, it breaks, isolates. A theatre of transdisciplinary fusion is a theatre that sings and re-enchantes. We are in the universe and we are universe.

To understand this earth and cosmic identity not only constitutes an individual, but familiar, social and spiritual health what it means to recognize theatre as a force of interaction with the universe. To understand it is to honor, on one hand, the theatrical lineage that there inherited: Zeami, Shakespeare, Stanislavski, Meyerhold, Artaud, Brecht, Grotowski, Beckett, Ionesco, Brook, Valencia, Serban and, for other one, the lineage of the deep knowledge illuminated by beings as Gurdjieff, Krishnamurti, Edgar Morin, Basarab Nicolescu, Lee Worley and Antonio Gómez Yepes, among others.

19.9 Invisible Bridges as Example of Transdisciplinary Theatre for the re-enchantment of the being and the world

Invisible bridges, was an trans theatrical event that was raising the need to establish deep contact with ourselves, with other ones and with the world, it was based on Citlalmina's origin dance that fuses the Tibetan of *The black hat* with the Mexican ritual and that from 1986 the Workshop of Theatrical Research (TIT) of UNAM uses as psychophysical training for actors and not actors. The text recounts across traditional Tibetans stories how Citlalmina arose. The event developed in two stages, first a tour for Chapultepec's thousand-year-old forest in Mexico city inviting the assistants to the communion with the trees and, later, in the clear one of the forest where the history was spreading out and there were carried out a series of participative actions created by the members of the TIT.

19.9.1 Transdisciplinarity in Invisible Bridges

Who were part in *Invisible Bridges* worked with the premise of connecting with our cosmic and conscious verticality, this meant to have the disposition to pass simultaneously along different levels of reality, we assume our bio - psychic condition as individuals being employed collectively at a space that was connecting us with our belonging to a sociocultural area: Mexico and its pre-Hispanic precedents - Chapultepec's Forest - and with the intention of linking ourselves - in the planetary level - with another space: the Tibet. The event developed, in addition, in connection with the land, with the trees and with the stars, that is to say in a cosmic level. This verticality made possible to overcome the separation between us as Subjects with the Object with which we were in relation. We were people joined by the individual and collective urgency of connecting across the Hidden Third with the Real. We gave mutually feedback of energy and creativity.

As for the logic of the Included Middle, we were conscious that we were, at the same time, actors and not actors, rather transactors. The complexity was residing in establishing dialogical, recursive and hologrammatic relations [26] to unify the levels of reality. In *Invisible Bridges* one was giving a dialog opened between languages, actions and realities; there was a circularity of cause-effect-cause and as well as we were recognizing ourselves forming part of the universe the universe were in us.

19.10 Concluding Remarks

Already it is not longer possible to continue increasing neither the pain of our so injured humanity, nor the suffering of our motherland. I feel that a new birth is increasingly urgent. It is no longer a matter of waiting for the arrival of the “new man” who, wanted the modernity, would be the result of an egalitarian and prosperous society. Is in every transtheatrical circle, breathing together with the same step, interlacing our bodies, looking at the eyes to recognize ourselves, dancing and singing with verticality, that we can give place to this new birth to restart later, with happiness in our hearts, the way without way of the infinitely human.

Transdisciplinary theatre makes us live re-enchanted and in a re-enchanted world that allows us to feel that we form a part of the infinite energy connected with everything that exists.

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About the Author



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CHAPTER 20

Transdisciplinary Art

Lily Yeh, Barefoot Artists, <http://barefootartists.org/>

This chapter outlines my work of a 30 plus year journey in building communities through art. What initiated my journey was my longing for a “dustless world” in the classical Chinese paintings, a Taoist ideal. As a community-based artist working with people from various communities in the world, I noticed that participants, from different regions and cultural backgrounds, of my projects often went through a process of individual and collective transformations despite the dire environments in which they live in. Over time, I discovered that my approach is transdisciplinary in nature and that the Taoist concept of Yin and Yang meshes well with the notion of the Hidden Third.

Keywords: Transdisciplinary art, barefootartists, community-based artist

20.1 Introduction: Transdisciplinary Art

I have been intrigued by Professor Basarab Nicolescu’s work on “Being transdisciplinary” and “The Hidden Third.” He suggested, “Being Transdisciplinary” is like a Zen koan: it has multiple meanings, depending on the level of understanding of the reader. Through my decades long work on community-based art, I would like to explore what “being transdisciplinary” means in the field of art.

Professor Nicolescu’s opening address at the ATLAS 2018 conference suggests that one of the meanings of “Being Transdisciplinary is Being of the transdisciplinary person.” It involves necessarily a spiritual evolution of a person, “enabling him or her to embody the unification of the Subject and of the Object through the action of the Hidden Third.” The Hidden Third seems to refer to the area between subjectivity and objectivity, the space between two opposites. It is dynamic and transformative. It divides but at the same time unifies.



The concept of “Being Transdisciplinary” brings forth in me the image of Tao. It is a circle divided by an S curve line. The pair of the opposites, the ying and the yang, the feminine and the masculine, the dark and the light, is locked in an eternal embrace. Nothing stays still. These two opposing and yet complimentary

forces are constantly moving to become each other. Each element contains the seed of its opposite and will eventually become its opposite. For the Chinese, this symbol suggests the way of nature, the cosmos, and its ever-evolving mystery.

Taoist teaching helps me to see things not only as they appear, but also their potentials. This understanding is essential in the work that I do in broken places in the world. When I see deficits, I see resources on the other side of the coin. When I see poverty, crime and devastation in traumatized communities, I also see the enormous potential and readiness for transformation.

I am an artist but an anomaly in the art world. I define art as creativity in thinking, methodology, and implementation. I don't have a private studio. Broken places are my canvas; disenfranchised people are my team members. Together, we create art works that at the end belong to the people.

Peter, a conference attendee, asked me what is interdisciplinary art. He looked it up online but could not find much information. That got me thinking.

I approach my projects through interdisciplinary and multidisciplinary lenses, using my skills in the visual arts (painting, sculpture, photography) and collaborating with people practiced in the fields of health, construction, job training and economic development. But the two disciplinary approaches described here do not reflect the transformative energy that often takes place during the development of my projects. If "being transdisciplinary" can unify all fields of knowledge and practices as suggested by Professor Nicolescu, its approach must be holistic and multi-dimensional. Its concern must include all aspects of life - nature, environment, people, society, science, technology, art and their inter-connectedness and balance. From online Wiktionary, I found that the prefix "trans" indicates "across, through, over, beyond," and I add "in between." To me, "being transdisciplinary" points to action and realization. For this dynamic process to take place, it requires an inner transformation (or spiritual evolution) of the involved person.

I have experienced the impact of this energy personally. I used to be a studio artist and taught at University of the Arts for many years. My effort in building an art park with people, mostly children at the beginning, on an abandoned lot in North Philadelphia was so profound that it changed the course of my life, from teaching in the academic world to community building and healing in traumatized places.

During my public art career of thirty some years, I collaborated with local communities to carry out projects that brought in colors, innovation, and fun activities. During the process of making art, we witnessed the emergence of some elements such as gentleness, trust, cohesion, and confidence that started to turn around some of the entrenched difficulties in the neighborhood such as drug addiction, frustration, low self-esteem, and fear. My training as an artist and my dedication to realize the vision revealed to me gave projects energy and direction. The beauty conveyed through our creation brought forth comfort and a sense of fulfillment. Through the process, inner transformation among the participants began to take place.

In our work, when we keep our hearts open, be attentive to the needs of others, and invite community to co-create, we observe that deep bonding, sincerity, and a sense of belonging, the heart and soul of a genuine community, begin to grow in the participants. When we create art that comes from the heart, art that reflects the pain and sorrow but also joy and beauty of the partaking communities, the process has the power to transform brokenness and grief to hope, new possibilities, and joy.

Since I learned this process through working in inner city North Philadelphia, I call it urban alchemy.



Figure 20.1: (Left) the abandoned lot next to Arthur Hall's headquarter, (right) Lily Yeh, Joseph (JoJo) Williams and neighborhood children at the start of the park building project in 1986.



Figure 20.2: (Left) Lily Yeh sketching out the new mural for Ile-Ife Park, (right) the completed Ile-Ife Guardian Mural in 1990.

20.2 A Personal Journey Made Public

When I was 15, my father took me to study Chinese landscape painting with a master. Painting landscape became the passion of my life. Through painting, I came in contact with a special place, which the Chinese call the “dustless world.”

Dust here refers not so much to the physical but the mental pollution such as self-centeredness, ignorance, attachment, and greed. The dustless world is a place of pristine beauty and poignant serenity. It is a place in this world and yet it reveals the mystery of “the other.” Through creating paintings, I was able to travel from the mundane world to that of the sacred. It is a place I found solace. It is a place I call “home.”

I have read much and traveled far looking for the “dustless world.” Through working with residents particularly children, I found the entryway to that “dustless world” in an abandoned place in inner city North Philadelphia. The act of creating art in broken places is like making fire in the frozen darkness of a winter's night. The beauty that we create together shines through the dark overcast of decay and despair. It brings light, warmth, hope and it beckons people to join in.



Figure 20.3: The construction process and the before and after images of Meditation Park.

20.3 The Village of Arts and Humanities

It evolved from a summer arts project on an abandoned lot to a multi-faceted non-profit community building arts organization. Lily Yeh was its co-founder, executive and artistic director from 1986 to 2004.

Mission: Through our innovative educational, social, construction, and arts programs, we aim to build a genuine community in which people are reconnected with their families, sustained by meaningful work, nurtured by the care of each other and will together raise their young. We understand that this is how social change manifests in action.

20.4 Ile- lfe Park

In 1986, Arthur Hall, the late visionary leader, eminent dancer, choreographer, and founder of Ile-Ife Black Humanitarian Center, invited me to build an art park on an abandoned lot next to his headquarter in inner city North Philadelphia. Ile-Ife in Yorba language means the house of love. To honor Arthur Hall, we named our first park Ile-Ife Park (see Figure 21.2). Here I also want to commemorate Joseph (JoJo) Williams, the first and only adult from the neighborhood to step in to help during the first two years of the project. He was the person who anchored our work in the

community. He became my teacher, guardian, and heart friend (see Figure 21-1).

20.5 Meditation Park

Situated right across the narrow street from Ile-Ife Park laid another big abandoned lot. In 1990 we launched one more park building project. Witnessing the tension and ordeal of life in inner city, I aspired to create a space where residents could retreat, relax, reconnect, and re-center. I named it Meditation Park (see Figure 21.3). I brought images that have inspired me, such as Chinese gardens, Islamic courtyards, and the sculptural Mali architecture into the design of the park.

Seeing that children were happy working with JoJo and me, adults came in asking for jobs. Some people advised me not to work with them because they had addiction problem. Figuring that we should not be bogged down by past mistakes and negativity, we needed to find a positive outcome through our cooperation. Together, the work team leveled the ground with a bobcat, poured foundation to build an undulating wall, and collaborated to mosaic the whole floor with stones and colorful tile pieces. Becoming skilled, the team took on renovating houses. Transforming the rugged brick wall facing the park into a colorful mosaic “Tree of Life” mural, we as a team felt empowered and proud through the beauty we fashioned together.

20.6 The Tree Farm

In the Village neighborhood we found a two-acre vacant lot near a railroad track. It was once occupied by General Electric but now highly polluted and littered with trash. In this inner city area with few trees, I felt that the land called to become a tree farm. With the help of the city government, generous funding from various sources, and under the guidance of tree expert Ken Kolodziej, the Village staff, Americorps members, and neighborhood volunteers worked together to transform dereliction to a green landscape made spectacular with mosaic animal sculptures. In addition to host grown trees, the farm cultivated 150,000 tree seedlings for the benefit of different neighborhoods in need (see Figures 21.4, 21.5, and 21.6).

20.7 Transformation of individuals

During my 18 years sojourn at the Village, I have witnessed many significant personal transformations. One of the most dramatic is the story of James (Big Man) Maxton.

He was called Big Man because of his huge stature, 300 pounds in a 6’8” frame. He was called Big for another and darker reason, using and selling drug in the community for two decades. His addiction has racked his body and sewn havoc in the community. He thought he would die one day in the gutter. He came to Jojo for refuge.

The city tore down a house in the middle of our block at the Village. I wanted to design something for the bare wall of this newly created hole. What to design?

Sensing danger lurking all around in our neighborhood, I figured, “why not evoke the presence of angels to protect this community? To serve this primarily African American community, the angels need to come from Africa.” Ethiopian angels were the answer.



Figure 20.4: (Left) The 2-acre abandoned industrial site before, (right) Neighborhood residents, guests, and Americorps volunteers holding hands in the dedication ceremony in 2000.



Figure 20.5: (Left) The newly planted and ribbon bedecked trees at the dedication, (right) Part of the tree nursery at the farm.



Figure 20.6: (These life-size sculptures were conceived by Lily Yeh and constructed and mosaic-decorated by Big Man and his four crew members, all coming from the immediate community.

If I wanted the angels decorated in mosaics, I needed help. Big Man never did art. He has lost everything precious in life at this point; the only thing he has was time. We decided to collaborate. I coached him on the art of color and mosaics. Piece



Figure 20.7: Angel Alley.

by piece he placed the broken tiles together to create the angels (see Figure 21.7). Although he suffered great physical and mental pains, the making of the angels gave him the strength to get up and face the day with new hope.

Passing by residents began to praise his effort and work. The positive feed backs comforted his broken spirit. He said to himself, “if Miss Lily returned next summer, I would leave drugs.” I stayed on with the project for a total of eighteen years. He left drugs and eventually became a well-established mosaic artist, the foreman of our construction crew, and the organizer of Narcotic Anonymous meetings at our organization for a ten-year period. He became a pillar of strength and light in this inner city community.

“The magic of art captures your heart and shields your mind away from the pain. By the time the heart and mind reconnect, there is no pain. The drug addiction is a psychological thing. When I pick up art and put down drug, it was a life saving and magical experience.”

James (Big Man) Maxton

20.8 The Power of Children

Reflecting on the building of the Village, if children did not step in to help us in our various endeavors, the Village would not have developed. Their enthusiasm, trust, innovation, and the sense of joy became essential in all our work.

In 1986 when I stepped into the project, no adults with the exception of JoJo, came to my help. But with children, it was a totally different matter. Seeing that JoJo and I were probing around on the empty lot, children from the neighborhood offered to help. Getting shovels, spades, brushes, pigments, and plenty of cement for children to play with, we started painting, digging, and making sculptures (see Figure 21.8). When paints peeled off from our sculptures, I decided that mosaics would be our solution. Our fledglings and teens became our first mosaic team. In



Figure 20.8: Ile-Ife Park.



Figure 20.9: Art works from children's workshop.

addition to making vibrant mosaics, they became the fervent guardians of Ile-Ife Park.

20.9 Their Imagination Fueled our Creativity

Many of the art works emerged from our children's workshop moved me with their power and originality. I began incorporating their works into my mural designs for some of our parks (see Figures 21.9 and 21.10).

20.10 Healing and Self-Empowering through Celebration and Ritual

20.10.1 Annual Arts Festival

Despite the dereliction and brokenness of our community, we celebrate our togetherness, creativity, and life. We launched our first arts festival in 1992. Again, the children's eager participation gave us courage to formulate our thoughts into reality.

Children dressed in colorful costumes, some with faces painted. Our head drummer Skip Burton led the procession. Holding paper baskets filled with fruits and vegetables, children, accompanied by parents and Village staff, marched on to the beat of the drums. The procession stopped in front of each house in our main street in the Village. When the door was opened, a child offered his/her basket of gift to



Figure 20.10: The two murals decorating Kujenga Pamoja (Together We Build in Swahili) Park at the Village. (Left) Flowers in Sunrise mural, integrating children's drawings into the mural design, (right) the Cosmic Night mural, including some images like space ships and insects by children. Both murals designed by Lily Yeh and executed by Village staff, crew members, and volunteers.



Figure 20.11: The arts festival.

the resident. We chimed in chorus, "May the good spirit bless this neighborhood. May the good spirit bless this household. And may the good spirit bless all the children." We threw confetti in the air and cried out in laughter and joy. When we passed vacant lots, we blessed the land with the wishes that some day the lots would be transformed into something lovely and beneficial to the community.

We formulized our blessing ritual at our first festival (see Figure 21.11). The yearly festival provided an opportunity to bring people together and celebrate. Children particularly loved the occasion to dress up, offer gifts, and have their voices heard in spreading the blessings. Our procession became longer, bigger, and more lavish as the Village grew in size and impact. The arts festival soon contained art exhibition, dance and theater performances, game competition, and food. The blessing is the heart of the ritual for it spreads kindness and good will for deep community bonding.

20.11 The Rites of Passage

Witnessing that young people in our community, particular boys, are very vulnerable to the many dangers in our neighborhood. I designed this ceremony to express to



Figure 20.12: Meditation Park (Photos by Matthew Hollerbush and Liz Murray).



Figure 20.13: Leaves burning in open air.

them that when they graduated from our programs, we would continue to be here for them, to listen, guide, and support.

Under months' preparation, teens in their white ceremonial gowns and with torches in hands would march into Meditation Park (see Figure 21.12). Surrounded by their families and friends, they mounted the platform to form a circle. With candles and torches in hand, the audience would say together to the teens, "We are your foundation. We will stand by you." Each teen would in turn utter his/her personal pledge. Then together they would say to the witnessing audience, "We respect you. We will work hard and realize our potentials. We will bring out light to the future." This became the transformative moment when we sensed the togetherness of our community witnessing the Coming Of Age Rite unfolding in a poignant space bathed in light.

After near two decades of service, I left the Village in 2004. The Village of Arts and Humanities of today, under the current leadership of Aviva Kapust and her innovative team, continues to receive awards and lead in the national movements of community building, youth education, and creative place-making.

In 2002, I became the founding director of a new non-profit organization, the Barefoot Artists, Inc.



Barefoot Artists works to empower local residents, organize communities, and take action to create a more compassionate, just, and sustainable future. Its logo expresses its intention to bring beauty and healing to broken places in the world.

20.12 The Twa Transformation, Rugerero, Rwanda

From dire poverty to a shared prosperity.

The Twa were the original inhabitants of the Great Lakes region of central Africa, including Rwanda. Over the centuries, they have been subjugated by the Hutu and Tutsi and driven from their land without compensation. In Rwanda, the Twa occupy only 1% of the current population and have no power in the nation's politics. Living in dire poverty, discarded and forgotten, they have become invisible.

Deprived of resources, the Twa find opportunity through working with the soil. Most of them become potters. Their poverty restricts them to fire their pots in the most primitive condition, with leaves burning in open air (see Figure 21.13). Their products sell for a pittance. Moved by their talent, energy, and their desperate situation, Barefoot Artists intervened in 2009. But how was the question.

20.12.1 An Ingenious Method in Creating Resources

Our team discussed giving the villagers goats. Damas, one of our team members warned us, “No, not with the Twa. They are people who have forgotten their own history. They don’t think of tomorrow. They will kill and eat the goats, dance all night and get drunk. Different NGOs have tried and failed.” “But, there must be a way,” I thought.

It was our resourceful Jean Bosco Musana Rukirande, the Barefoot Artists Rwandan program coordinator and a former regional director of Red Cross, who came up with an innovative and successful goat rearing program. At the start, Barefoot Artists provided only half of the 36 families with goats (see Figure 21.14). Goats multiplied. Within six months, the other families received their goats too. This was the first step in organizing the community, building mutual trust, and establishing steps to generate assets.

20.13 Building together, the Rugerero Pottery Center

To understand how Barefoot Artists could further help them, we held community meetings. They asked for help to build an art house where their wares could be properly displayed for better pricing. Musana Rukirande helped Barefoot Artists to



Figure 20.14: The goat sharing ceremony at the Twa village in Rugerero in 2010.



Figure 20.15: (Left) Celebrating the purchase of the land for the art house, (right two) villagers removing rocks and leveling ground.



Figure 20.16: Collective decision making.

purchase a piece of land for the building project (see Figure 21.15). The villagers now collectively own the land through their newly established cooperative. They asked us not to hire people from the outside because they wanted to do the work themselves. Soon after the acquisition, the whole village, men, women, and children, mobilized to clear away the sharp edged volcanic rocks and tree roots. Working with great eagerness, they readied the ground in short order for construction.

20.13.1 Setting up a Situation of Equality through Collective Designing

The next question was what to build on this newly cleared land. We asked them for suggestions.

Following Musana Rukirande's insightful suggestion, Barefoot Artists organized a series of workshops in which men, women, and children worked separately to express their respective visions for the art house (see Figure 21.16). Through the process and in all the three groups, their desire for one art house expanded into an art compound,



Figure 20.17: Twa villagers and volunteers painting murals and making mosaics at the pottery center.



Figure 20.18: (Left) The exhibition building in the Pottery Rugerero compound, (right) the communal workshop space.

which would contain a communal workspace, a large high temperature kiln, a storage room, an exhibition space, and a large bathroom with shower and toilet.

20.13.2 Made Visible and Successful through Art

After sharing designs in the group presentation, villagers agreed on the final layout of the construction plan. Lily Yeh created the designs for the façade and the Twa dancers mural for the exhibition building. Villagers painted the storefront with floral patterns and decorative pots (see Figure 21.17). They named the compound Rugerero Pottery (see Figure 21.18). Although the art techniques were not perfect, the colorful and unique compound attracted visitors. People began to notice them. Many arrived by motorcycles and cars to purchase their goods. Through working together, they managed to buy firewood for high temperature firing, produce bigger pots, create new forms like animal sculptures, and charge higher prices for their wares (see Figure 21.19). Soon local government noted them. Then the villagers regularly get commissions from the government such as producing one-stick-energy-saving stoves for mass consumption.

On Sep 17, 2017, I received an email from our program coordinator Musana Rukirande updating me the situation of the Twa.

“Dear Mama Lily:



Figure 20.19: The various products from the Pottery Rugerero photos by Teresa Yeh, Musana Rukirande, Lily Yeh

Some days ago President Kagame and the rich American (Howard) Buffet inaugurated a big office building of immigration at the border with Congo!! All materials for decoration near the building are from the Twa pottery. Today when I passed by the border, a friend who worked there told me that Kagame and Buffet were attracted and touched by the art of the Twa. They are well made and authentic. Also many districts have bought big pots (from them) to decorate places for presidential election campaign. Really they are doing very well, proud and self-sufficient. Some are building new homes. They are the first Twa in the country to do that.”

20.14 Reflection

Recently, reading letters from people who created projects that were inspired by our work, I realized that the essence of all of our endeavours is really about humanity and the heart. Below is the most recent email I have received on Sept. 17, 2018 from Ana Maria Fomin of Petru Rares National College and the director of a youth mural project in Suceava, Romania.

“Your art and powerful message represent for us that wonderful gift of love we had been waiting for to understand how we can be closer to our dream, our ‘dustless world.’ I am grateful for everything we have learnt from you. We have been transformed, as we feel stronger and more motivated to work hard and open our hearts. There is so much to say, and words seem to just melt in a wave of love that embraces all of us.”

I would like to conclude with these words from Mahatma Gandhi, “There is a force in the universe, if we permit it, will flow through us and produce miraculous results.” Is this the Hidden Third?

About the Author



Lily Yeh is an internationally celebrated artist whose work has taken her to communities throughout the world. As founder and executive director of the Village of Arts and Humanities in North Philadelphia from 1968 to 2004, she helped create a national model in creative place-making and community building through the arts. In 2002, Yeh pursued her work internationally, founding Barefoot Artists, Inc., to bring the transformative power of art to impoverished communities around the globe through participatory, multifaceted projects that foster community empowerment, improve the physical environment, promote economic development and preserve indigenous art and culture. In addition to the United States, she has carried out projects in multiple countries including Kenya, Ivory Coast, Ghana, Rwanda, China, Taiwan, Ecuador, Syria, Republic of Georgia, Haiti, and Palestine. (www.barefootartists.org)

In 2004 she launched a decade long Rwanda Healing Project which aimed to address the lingering grief of the 1994 genocide. As part of this project, she transformed a rough mass grave into a beautiful memorial park in Rugerero. It became the official genocide memorial for the region. In addition, she launched multiple programs in healing, education, and job opportunities to transform the survivors and the Twa villages in Rugerero from destitution and grief into vibrant and joyful self-sustaining communities. Using art as a medium for social change, Yeh has positively influenced many impoverished communities worldwide.

CHAPTER 21

Objectives are Subjective

Mambet Cantemir, *Assail Drilling Company, Cassar Building, Triq il Barjola, Gudja, GDJ 2020, Malta.*

Besides being very actual and controversial, the problematic of risk management and decision-making raises again questions about human capabilities of planning and achieving planned goals. This paper is intended to indicate some possibilities to approach risk assessment and risk management according to the transdisciplinary (TD) methodology, in a more accurate and at the same time, more consistent and more effective way.

Keywords: risk, decision-making, object, subject, transdisciplinarity.

21.1 Introduction

Historically, several attempts were made to understand and even formalize the risk assessment processes and the subsequent decision-making. Similar attempts are still made today. Both risk management practitioners and theorists are facing multiple challenges arising from the inherent limitations of disciplinary approaches, since current developments in this area don't provide significant improvement of practices and understanding of risk and decision making processes.

Usually, the most common risk definitions emphasize elements of uncertainty and/or magnitude of impact and consequently, trigger approaches, concepts, methods and measurements of the same nature. These are the methods used today. At the same time, many disciplinary perspectives involve sophisticated concepts and methods, as applicable. However, today it is already obvious that the increased complexity of human activities has shown the "limitations" (read: failures) of the approaches used currently. Failures are not due only to the intrinsic reductionism of the disciplinary approaches. One of the main causes is of a fundamental nature, since "risk" is neither (and cannot be) absolutely objective, nor absolutely subjective. Therefore, "risk" doesn't have a standalone existence either objectively, or subjectively.

21.2 Beyond definitions

Academic research, Figure 19.1 [1] indicates that a relationship between "planned" and "achieved" can belong to three domains, "[...] one "pole" on this scale is deter-

Ignorance	Risky Situation	Complete Knowledge
Pure Uncertainty	Probabilistic	Deterministic

Figure 21.1: Decision-making domains.



Figure 21.2: ERM goals are different for different industries.

ministic. [...] The opposite "pole" is pure uncertainty. Between these two extremes are problems under risk. [...]" (see Figure 19.1).

This type of classification is rigorous and very useful within the accepted boundaries, but nevertheless, limited. It is an intrinsic limitation, due to the mere disciplinary nature of the approach. It does not (cannot and doesn't have to) cover the variety of uncertainty types, as encountered in our common experience.

Without comparing the deterministic domain and the domain between "probabilistic" and "pure uncertainty" and solely relying on common experience it can be said that uncertainties are of many different kinds, belong to many areas and reveal the complex nature of the problem.

In order to deal with complexity, it seems necessary to use another approach since the current ones do not (cannot and don't have to) cover the description of the context for the decision-making process, the formulation of an objective (as a distinct process), nor the decision-making process itself.

The most recent and very rigorously elaborated definition of risk [2]: "Risk: 'effect of uncertainty on objectives'" illustrates/ re-discovers in a very pragmatic

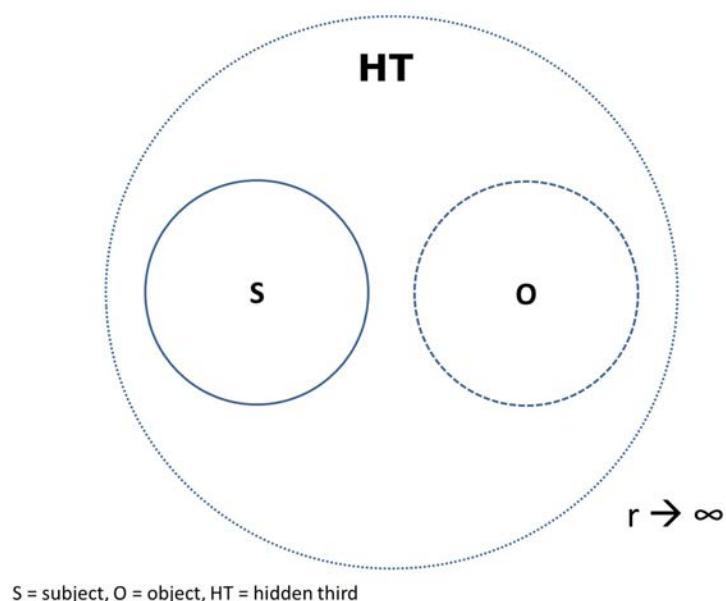


Figure 21.3: Subject – Object relationship.

manner, the fundamental need for a subject and an object, as well as of their interaction. Similarly, the activities aimed at managing risks are also defined through: “Risk Management: ‘Coordinated activities to direct and control an organization with regard to risk.’”. Such a dependence on the subjective definition of an objective is demonstrated in many instances, but for illustration purposes only, I have chosen the following example in Figure 19.2 [3], entitled “Corporates mean different things when they talk about enterprise risk management”,

Without an objective (formulated, validated and pursued by some “subjective” entity - could it be otherwise?) risk cannot exist. To better illustrate the interaction of the three elements, I use Figure 19.3, an adapted form of the graphical representation of the Subject – Object relationship [4].

Since “formulated objectives” are subjective, the emergence of “risk problematic” is possible only in the subject area, whereas the “result: effect of uncertainty” is supposed to belong the object area (Figure 19.4).

An ideal cause-effect relationship, deterministic and even probabilistic in nature is represented through a black arrow. As mentioned above, such relationships are quite seldom in our common lives since our lives are complex. An honest evaluation can show that decision-making in the context of e.g., roulette gambling or variations of the stock exchange markets are less complex than decision-making related to our daily survival, and of course less frequent. Therefore, it is no exaggeration to state that such “straight-line” (ideal) relationships are an exception, a mere accident, whereas the real relationship could be “described” by means of the purple line.

Figure 19.5 shows the gap between “desired” and “achieved” or to follow the definition above, “the effect of uncertainty on objectives”.

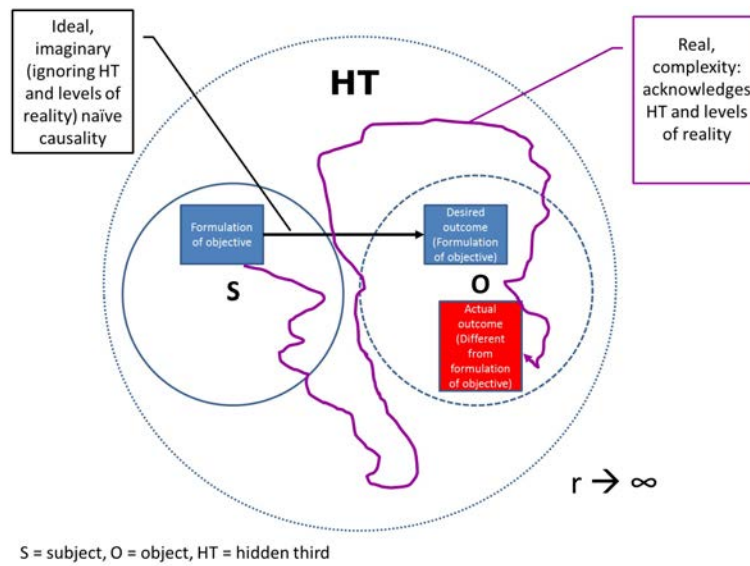


Figure 21.4: Relationship between “formulation of objective” and “outcome”.

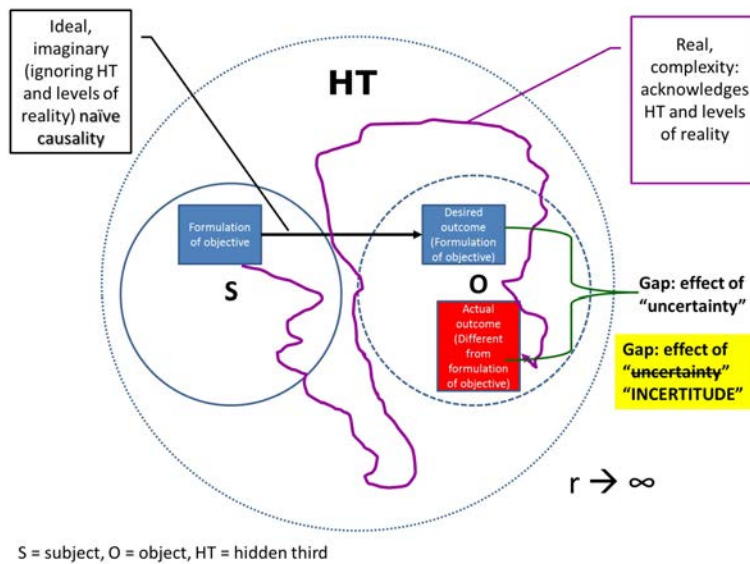


Figure 21.5: Gap between “desired” and “actual” outcomes.

But again, what uncertainty?

Our planning and decision-making processes are inherently affected by uncertainty. Following the TD methodology, it is possible to acknowledge that the inherent “sources of uncertainty” could be attributed both to the nature of the Subject-Object-Hidden Third interaction (Figure 19.5) and to the zone of non-resistance between the levels of reality of the Subject and of the Object. I used the quotation marks, because discovering under this disguise (i.e. as a “source of uncertainty”) the action of the Hidden Third in relation to the Subject and the Object is at least, astonishing.

At the same time, the “uncertainty” attributed to the zone of non-resistance between the levels of reality is more apparent through the obvious biases pertaining to the identification and evaluation of risks, as well as to the planning of treatment actions, both on the Subject and Object sides. This aspect is outlined especially through the recognition of biases and the acceptance of their impact on risk assessment and decision-making [5].

These considerations are far from being just theoretical, or of epistemological relevance. It can be firmly stated that corporations today started to acknowledge the impact of biases and either accept it, or attempting to reduce or avoid it. “[...] debiasing business decision making has drawn board-level attention, as companies doing it are achieving marked performance improvements. [...] Group psychological behavior produces some of the most powerful biases in business settings. Group dynamics can cause managers to sacrifice reasonable dissent to enhance their associations, maintain the favorable perceptions of others, and keep competitors at bay. They may recognize but choose to ignore flaws in the analyses and proposals of their allies, so these kinds of biases are not cognitive in nature – they do not relate, in other words, to the acquisition and assimilation of knowledge. Rather, they are generated by the group setting itself, in which managers almost consciously relinquish good logic as they compare and evaluate options for action. [...]” [6].

Figure 19.6 [7] illustrates better the considerations above, while assuming that an event is defined as A: “Objective completely achieved as desired” (blue square), whereas its opposite (logical negation) is non-A: “Objective not completely achieved as desired” (red square).

It could also be said that within the accepted structure of Levels of Reality (LR) the problematic situation might be illustrated by means of two epistemological ternaries: Subjectivity – Objectivity – Complexity and Intellect – Body – Emotions/ Feelings in relation to evaluating and prioritizing decisions and activities. The next paragraphs will outline an improved classification of the uncertainty types as well as of the risk treatment activities.

21.3 Re-formulation of the problematic situation

From a disciplinary perspective, one of the most relevant classifications of uncertainties is presented in [8], Figure 19.7.

While fully acknowledging the “effect” of the Hidden Third in all aspects of knowledge and their combinations as outlined in this table (and the relevance of both epistemological ternaries), it is also possible to ascribe specifically to each type of knowledge (respectively, about likelihoods and outcomes) the impact of non-resistance zones between the Levels of Reality of the Subject and of the Object (where the ternary Intellect – Body – Emotions/ Feelings is particularly relevant). Treatment actions would be adapted accordingly.

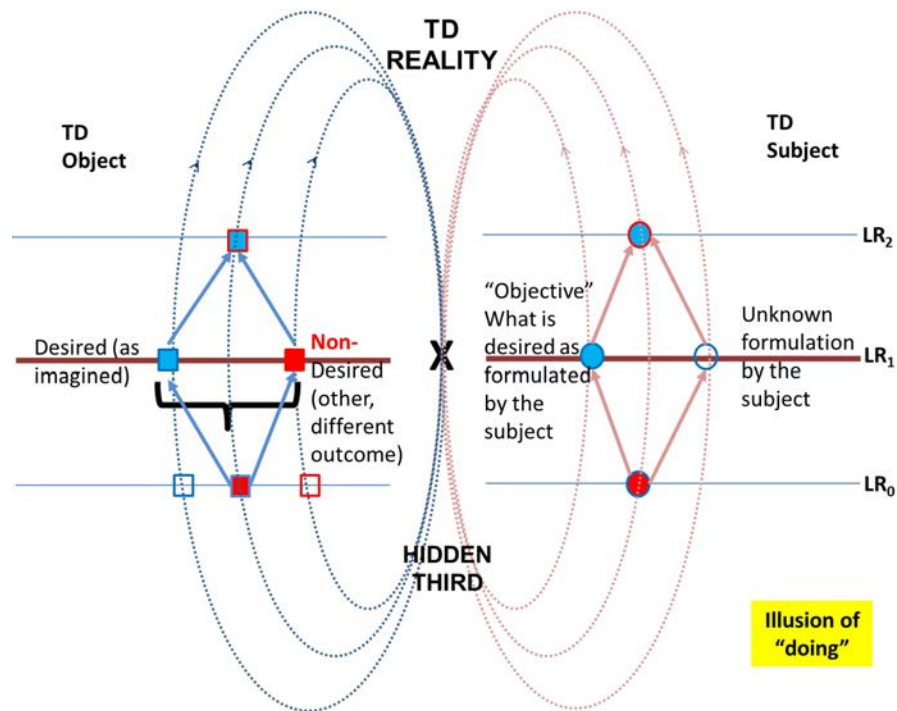


Figure 21.6: Levels of reality; gap between “desired” and “actual” outcomes.

The same paper includes the following descriptions of the combinations derived from the degree/ quality of knowledge of likelihoods and outcomes:

- “[...] RISK is the zone where outcomes and likelihoods are reasonably well known. This is the region of risk analysis or risk assessment, where various outcomes are looked at for the ‘dangers’ that they carry.
- UNCERTAINTY applies where there are no firm bases for probabilities, yet some reasonably clear idea as to outcomes should an adverse probability come into play.
- AMBIGUITY applies to circumstances where the outcomes are not clear, but there is evidence of likelihood that is reasonably well known.
- IGNORANCE applies where there is an innovative technology or a product or substance that is synthesized and is not replicated in nature, and where there is no history of cause and outcome to predict consequences. This means that science cannot, by its own rules predict either likelihood or outcome. [...]”

Recent surveys [9] indicate a close correlation between improved performance of investment decisions and five elements that are directly connected to the subjective aspects of decision making for investment. However, some survey results indicate that “[...] when deliberating over investment and other strategic decisions, managers have many practices at their disposal to ensure sound decision making: presentation

	KNOWLEDGE ABOUT OUTCOMES	
	Well defined outcomes	Poorly defined outcomes
KNOWLEDGE ABOUT LIKELIHOODS	Some basis for probabilities Risk	Ambiguity
No basis for probabilities	Uncertainty	Ignorance

Figure 21.7: knowledge of outcomes, likelihoods and “incertitude”.

of information that contradicts leaders’ views, for example, and explicit discussions of the range of potential outcomes. Only 60 percent of respondents agree that decision makers explicitly discuss uncertainties when making resource-allocation decisions. And only 41 percent agree that their companies consider a range of potential outcomes or scenarios for a given investment.”

To illustrate the potential for improvement, one has to note that even in the case of evidence-based decision making only “[...] when asked which specific techniques their companies’ managers use to improve decision making, the largest share of respondents, 59 percent, cite scenario analysis. But no more than one-third cite any of 12 other commonly referenced checks on biases, such as pre-mortems, postmortems, and explicit meeting rules. (We define “pre-mortems” as an analysis of what can go wrong or right before the project is under way and “postmortems” as an analysis of what went wrong or right after the project is completed. “Explicit rules for meetings” could include getting all ideas onto the table before discussing and/or the CEO expressing his or her opinion after everyone else on the management team or group has done so.) Nevertheless, the results suggest that the use of such techniques can lead to better performance. Respondents whose companies make the most use of evidence-based decision making are 36 percent likelier than their peers whose companies don’t use these techniques to report growing faster than competitors. And they are 22 percent more likely to say their companies are more profitable. [...]”.

Therefore, using the TD methodology has a significant potential for improving both the techniques for decision making and the decision-making process itself. A more detailed presentation will be made available in a separate article. For the moment, I will use Table 22.1 to outline the connection between the above mentioned disciplinary findings (types of uncertainty), treatment strategies and the TD concepts

Table 21.1: “Incertitude” and Concepts of TD Methodology

Type of “incertitude”	Management strategy	TD concept
Risk	Science based	Levels of Reality (Subject – Object)
Uncertainty	Precautionary	Levels of Reality (Subject – Object), non-resistance zone
Ambiguity	Precautionary/ Discourse based	Levels of Reality (Subject – Object), non-resistance zone, Hidden Third
Ignorance	Precautionary/ Discourse based	Levels of Reality (Subject – Object), non-resistance zone, Hidden Third

(since all concepts in the TD methodology are applicable, I indicate only those of immediate relevance and manifestation on the correspondent type of “incertitude”).

Management strategies will be improved specifically based on the TD concepts and using the epistemological ternaries for contextualization. In this respect an important part is played by the description/ characterization of risks and “incertitude” types. The next section will provide more detail about description and risk dimensions.

Of particular relevance for the potential TD developments are the articles and working papers published by Andreas Klinke and Ortwin Renn since their approach is already interdisciplinary [10]: “[...] The interdisciplinary risk estimation comprises two activities:

1. Risk assessment: producing the best estimate of the physical harm that a risk source may induce;
2. Concern assessment: identifying and analyzing the issues that individuals or society as a whole link to a certain risk. For this purpose the repertoire of the social sciences such as survey methods, focus groups, econometric analysis, macro-economic modeling, or structured hearings with stakeholders may be used.

There are different approaches and proposals how to address the issue of interdisciplinary risk estimation. The German Advisory Council on Global Change (WBGU) has developed a set of eight criteria to characterize risks beyond the established assessment criteria [...]. Introducing the process of “concern assessment” facilitates the introduction of other risk dimensions and provides a starting point for a TD approach since consideration is given also to “framing” [11].¹

¹According to Robert Entman, to frame is “[...] to select some aspects of a perceived reality and make them more salient in a communication text, in such a way as to promote a particular problem definition, casual interpretation, moral evaluation, and/or treatment recommendation for the item described [...]”

21.4 If Risks Exist, These Have More Than two Dimensions

Commonly, for the description and communication of risks, special emphasis is put on two dimensions relevant to the specific risk scenario: magnitude of impact/ effect (adding “on objectives” according to above mentioned definition) and likelihood of occurrence (already detailed in the previous section).

Klinke and Renn [10] suggest the following criteria/ dimensions:

“[...]

- *Extent of damage*: Adverse effects in natural units, e.g., death, injury, production loss, etc.
- *Probability of occurrence*: Estimate of relative frequency, which can be discrete or continuous.
- *Incertitude*: How do we take account of uncertainty in knowledge, in modeling of complex systems or in predictability in assessing a risk?
- *Ubiquity*: Geographical dispersion of damage.
- *Persistence*: How long will the damage last?
- *Reversibility*: Can the damage be reversed?
- *Delay effects*: Latency between initial event and actual damage.
- *Potential for mobilization*: The broad social impact. Will the risk generate social conflict or outrage etc.? Subcategories here are:
 - *Inequity and injustice* associated with the distribution of risks and benefits over time, space and social status;
 - *Psychological stress and discomfort* associated with the risk or the risk source (as measured by psychometric scales);
 - *Potential for social conflict and mobilization* (degree of political or public pressure on risk regulatory agencies);
 - *Spill-over effects* that are likely to be expected when highly symbolic losses have repercussions on other fields such as financial markets or loss of credibility in management institutions.[...]”

Of particular interest for using a TD methodology in the future approaches are the names from the Greek mythology used by the authors for risk categories. These names are not only very illustrative, but describe in a much more accurate way the Subject-Object relationship. While considering the already classical “impact-likelihood” dimensions it is possible to see in Figure 19.8 [12] a good indication of how several dimensions are used for improving the risk classification.

In the same article, the authors state “[...] they (myths, T.N.) are, however, reminders of the genuine forces that are inevitably present in the making of new technological eras. They can guide us through the clouds of uncertainty and ambiguity associated with new scientific advances and technological breakthroughs. Far from providing recipes for managing technologies and risks, they can help us to orient ourselves in the tension between courage and caution and to create powerful images that provide sources for understanding and handling risks in modern societies.

Also [13], “[...] Although history has recorded numerous examples of unwarranted anxieties, there have been equally worrisome accounts of overconfidence in allegedly

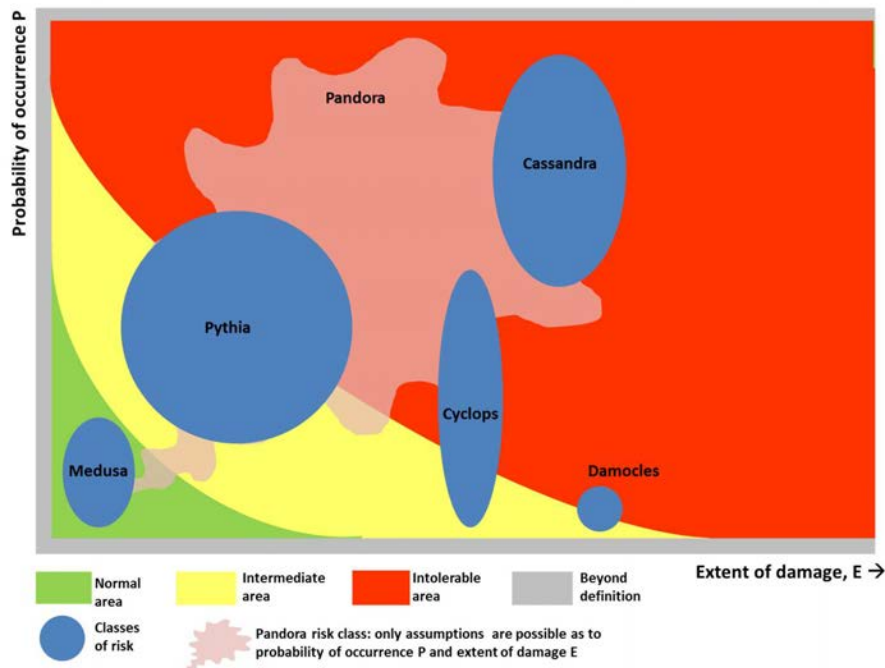


Figure 21.8: knowledge of outcomes, likelihoods and “incertitude”.

fool-proof safety measures and human abilities to cope with disasters. The responses to the change of technology over time seem to oscillate between the carelessness of Epimetheus and the foresight of Prometheus, between the real disasters of Pandora’s box and hope, the ultimate gift of the gods to humankind. [...]

And it is remarkable to note that in the field of risk management researchers and practitioners started to accept the limitations of the so-called “scientific” or “objective” approaches and try to fundamentally improve their practice and research. The TD methodology allows this improvement of a fundamental character [14], since “[...] Transdisciplinarity means “beyond” disciplines not in the sense of dismissing them but removing their intrinsic claims to a single knowable reality and epistemology. [...]”. I am quoting this article, as it contains a similar description of the effort to re-discover a more accurate and at the same time, sincere Subject-Object relationship: “[...] Like psychology itself, “literary studies” was invented in the nineteenth century under the influence of the proliferation of disciplines sponsored by the dominance of empirical science. These new disciplines were the “Social Sciences,” meant to employ the objectivity of science to human and cultural matters. Objectivity means just what The Red Book laments. That Jung had found the human soul [15]: “I had judged her and turned her into a scientific object.” Similar “objectivity” [14] pervaded literary studies in the twentieth century with the determination of its “New Criticism,” that the text was an object, sufficient in itself to generate knowledge with no participation from either the personality of its author or its reader. [...] Here we see disciplinary division as a primary severing of being. [...]”

Therefore, based on interdisciplinary research and after acknowledging the need for a better classification and description of risks, the basis is set for a TD approach.

The potential for TD developments is described in the following table, synthesizing the categories of risks, their names, subsequent treatment strategies, epistemological ternaries relevant to the TD approach and derived from these, managerial actions (suggestions at tactical level).

Table 22.2 outlines several risk classes and treatment strategies and TD concepts are emphasized for each risk class. At the same time, our current experience could be summarized in the statement of Klinke and Renn [16], “[...] most risks are characterized by a mixture of complexity, uncertainty, and ambiguity. Smoking may be a good example for low complexity and uncertainty but high ambiguity. Nuclear energy may be a good candidate for high complexity and high ambiguity but relatively little uncertainty. Endocrine disruptors could be cited as examples for high complexity, uncertainty, and ambiguity. [...]”

It should be noted that strategies and tactics derived especially from the application of the epistemological ternary Intellect – Body – Emotions/ Feelings have an important role in dealing with ambiguity or ambivalence. By definition, TD methodologies will assist in (1) interpreting factual statements about the problem (e.g., mobile phones, pesticide residues in food) and (2) reconciling the differences in applying normative rules to a specific situation (e.g., ban or no ban on smoking).

Nevertheless, “[...] high complexity and uncertainty favor the emergence of ambiguity, but there are also quite a few simple and almost certain risks that can cause controversy and thus ambiguity. It is therefore important to distinguish between complexity, uncertainty and ambiguity: these three terms are correlated but they are not identical.”

21.5 Conclusions

The increased complexity of human activities has shown important and costly limitations in the field of risk management and decision making. The article shows the possibility to connect findings from disciplinary and interdisciplinary research and practice in order to develop a transdisciplinary (TD) approach. Based on TD methodology it is possible to improve both the techniques for decision making and the decision-making process itself.

Current and future results of research and practice will be presented in detail as a continuation of this article.

Acknowledgments

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Table 2: Risk Classes and Concepts of TD Methodology

Management	Risk class	Extent of damage	Probability of occurrence	Ambiguity	TD concepts Contrastualization/ TD epistemological terms	Strategies for action at local level
Science-based (Complexity)	<i>Damocles</i> (technological risks such as nuclear energy, large-scale chemical facilities and dams)	high	low	Low	Levels of reality (0): Subjectivity – Objectivity – Complexity	<ul style="list-style-type: none">• Reducing disaster potential• Ascertaining probability• Increasing resilience• Preventing surprises• Emergency management
	<i>Cyclops</i> (earthquakes, volcanic eruptions, floods, appearance of infectious diseases, nuclear early warning systems)	high	uncertain	Low	Levels of reality (80), non-resistance zones: Subjectivity – Objectivity – Complexity and Intellect – Body – Emotions/ Feelings (assessment of probabilities)	<ul style="list-style-type: none">• Implementing precautionary principle• Developing substitutes• Improving knowledge• Reduction and containment• Emergency management
Precautionary (High incertitude)	<i>Pythia</i> (global warming, instability of the West Antarctic ice sheet, genetic engineering in agriculture and food production)	uncertain	uncertain	Significant	Levels of reality (80), non-resistance zones: Subjectivity – Objectivity – Complexity and Intellect – Body – Emotions/ Feelings	<ul style="list-style-type: none">• Improving knowledge• Reduction and containment• Emergency management
	<i>Pandora</i> (human interventions in the environment also cause wide ranging, persistent and irreversible changes without a clear attribution to specific damages)	uncertain	uncertain	Significant	Levels of reality (80), non-resistance zones: Subjectivity – Objectivity – Complexity and Intellect – Body – Emotions/ Feelings	<ul style="list-style-type: none">• Improving knowledge• Reduction and containment• Emergency management
Discursive (High ambiguity)	<i>Cassandra</i> (death, the delay effect leads to the situation that no one is willing to acknowledge the threat)	high	high	High ("Low" due to delay effect)	Levels of reality (5), Hidden Third: Subjectivity – Objectivity – Complexity and Intellect – Body – Emotions/ Feelings	<ul style="list-style-type: none">• Consciousness-building• Confidence-building• Consensus seeking• Public participation• Risk communication• Contingency management
	<i>Medusa</i> (electromagnetic fields, eutrophication, smoking, extent of damage was assessed as low by most experts; neither epidemiologically nor toxicologically significant adverse effects could be proven. Exposure, however, is wide-ranging and many people feel involuntarily affected by this risk)	low	low	Significant	Levels of reality (80), non-resistance zones: Hidden Third: Subjectivity – Objectivity – Complexity and Intellect – Body – Emotions/ Feelings	<ul style="list-style-type: none">• Consciousness-building• Confidence-building• Consensus seeking• Public participation• Risk communication• Contingency management

CHAPTER 22

The Role of Observation in Being Transdisciplinary

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A “Being Transdisciplinary”, as being on another level of Reality than the usual way of being, is necessarily subjected to another collection of laws. As one of the postulates of Transdisciplinarity states that the transition between the levels of the Reality is performed under the logic of the included middle, becoming Transdisciplinary in being requires the conscious effort of living the ternary structure of Reality. While the ternary structure of Reality is objective and it does not depend on the Subject, the degree of quality of the participation to Reality is precisely the subjectivity opposed to this objective law. This participation, being spiritual in nature as it involves at once the intellectual, emotional and physical components of the living organism and not just one or two of them sequentially, does not happen by itself on a regular basis, but by specific work and practice. This specific ternary subjective participation to the objective Reality is what creates the Transdisciplinary experience. Its methodology is rigorous and it involves the exploration of the relation between the included third and the Hidden Third by the “inner witness” generated by the ternary interaction. The Transdisciplinary researcher seeks objective understanding; the quality of objective understanding, reconciling information and experience, depends on the quality of the act of observation, hidden in plain sight within the process.

Keywords: Being transdisciplinary, structure of reality, being spiritual.

22.1 Introduction

As any Transdisciplinary researcher knows, the difference between the levels of the Reality is a difference between the laws which are applicable to them. When discussing what it means to be Transdisciplinary we have first to ask ourselves in this respect if there is a difference in terms of levels of Reality compared to any other form of being, because that would mean that there are other laws applying when being Transdisciplinary compared to when not being Transdisciplinary. We also notice that the key word is “being”.

Transdisciplinarity is defined as a science of methods, a methodology.¹ It studies

¹Basarab Nicolescu, “Methodology Of Transdisciplinarity – Levels Of Reality, Logic Of The Included Middle And Complexity”, in *Transdisciplinary Journal of Engineering &*

what is at the same time inside disciplines, across disciplines and beyond disciplines.²

Therefore, the access to this methodology depends on a specific way of being of the researcher, a certain attitude, an inner posture. The concept of degrees and levels of inner being comes into attention. In this respect, it has to be stated very clearly that being Transdisciplinary and the Transdisciplinary research are not just an intellectual activity, and Transdisciplinary knowledge cannot be obtained without Transdisciplinary being, at least at a certain extent. Poetically speaking, Transdisciplinarity was described as the ternary balance between knowledge and being.³

We can conclude so far that there is no Transdisciplinary knowledge without being Transdisciplinary: being on another level of Reality than the ordinary way of being, meaning there are other collections of laws applicable. The unity of knowledge as an imperative purpose of Transdisciplinarity has to take into account that, as the level of Reality of the Object have as correspondent the levels of perception of the Subject, the exterior unity of knowledge needs the interior unity of being. What we know depends on what we are. The informational flux and the consciousness flux correspond one to another. And as the structure of Reality is ternary, the Transdisciplinary participation to Reality is also ternary: the Transdisciplinary understanding⁴, reconciling knowledge and being by correspondence between the levels of Reality of the Object and the levels of perception of the Subject, is obtained in vivo. Seeing and understanding are two faces of the same coin, just as the English verb "I see" suggests. The scope of this paper is to approach the practical modality for obtaining it: how it is actually done.

22.2 Observation

The structure of Reality is ternary and any thinking based on the ternary structure of Reality is of immediate application.⁵ As an expression of the open unity in diversity, the human organism, being part of the ternary Reality, has the same ternary structure,⁶ but cannot be reduced to it. So the thinking, the reason, the intellect, works for the Transdisciplinary researcher together with the other two symbolic components of the biological organism- the emotion and the physicality, in order to obtain the so called Transdisciplinary being (see Figure 1). The separation of these levels of Reality of our biological being is due to the inner discontinuity that on one hand creates fragmentation of the usual being but on the other hand allows the openness of space which makes possible the Transdisciplinary being by its very epitome, the hidden third.

As there is no ternary without binary, the materiality of this interior space built on the logic of the included third depends mutually on the materiality of the exterior space, which is built on the binary levels, under the logic of the excluded third. The

Science Vol. 1, No. 1, December, 2010, p.19-38.

²Idem, *Transdisciplinaritatea: Manifest*, Junimea, Iasi, 2007, p. 53.

³Idem, *Poetical theorems*, Curtea veche, Bucuresti, 2013, p.80.

⁴"The unification of the Subject is performed by the action of the hidden third which transforms knowledge in understanding. Understanding means fusion of knowledge and being" Idem, "Methodology of Transdisciplinarity", p. 17., https://www.academia.edu/14441459/METHODOLOGY_OF_TRANSDISCIPLINARITY Last accessed 14.11.2018.

⁵Idem, *Noi, particula și lumea*, Junimea, 2007, p. 244.

⁶Idem, *Ce este realitatea?*, Junimea, 2009, p.55.

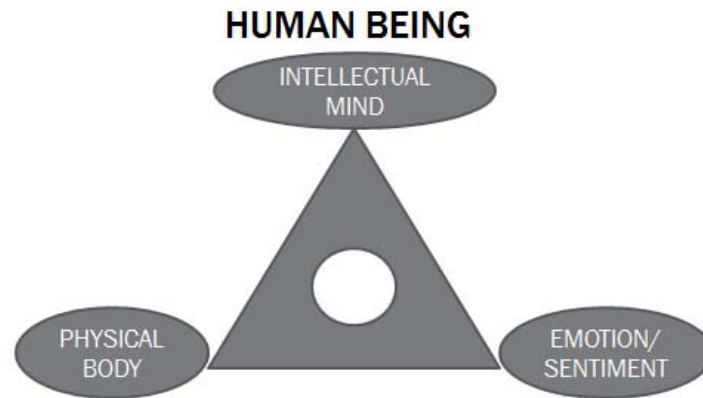


Figure 22.1: The human being as biological expression of the logic of the included third by three substances: affective, intellectual and physical.

binary logic creates a contradiction between being Transdisciplinary and just being, which in its turn is expressed in various contexts under different contradictory pairs: Subject- Object, being involuntary vs. being voluntary, being sequential vs. being simultaneous, being predetermined vs. being spontaneous, etc. This cyclical trap of binary thinking prevents participation to Reality to go beyond 2 and keeps it between 0 and 1, between experience and reductionist thinking.

For being Transdisciplinary, this predicament has to be surpassed. The key to escape the binary contradiction between ternary and binary, which makes many Transdisciplinary researchers to not be Transdisciplinary at all, is the relation between the hidden third and the included third, which can only be understood under the logic of the included middle. Under the logic of the included middle, they are both different and the same or neither different nor the same, at the same time. It's 3 and 4 at the same time or neither 3 nor 4: the quaternary is not really different from the ternary.⁷ It's the binary logic that projects the ternary contradiction into itself and its opposite: two binary contradictions, between the logic third and the a-logic third and between the third in a specific level of the Reality and the third in no level of Reality. The third is an interaction term, and it appears as an interaction of three, reconciling the cause and the result of the phenomena.⁸

For being Transdisciplinary, the practical modality to achieve the said participation to Reality which leads to Transdisciplinary knowledge and understanding is the **practice of observation** (see Figure 2). Observation is not to be mistaken for intellect, for experience or for emotional state, as it is precisely the result of the interaction of the three, as an emergent property of the system. The exercise of observation does not happen by itself, (this would mean that all being is Transdisci-

⁷Ibidem, p. 119.

⁸"Source of Reality, the hidden third feeds itself on this Reality, in a cosmic breath which includes us and the universe". See Basarab Nicolescu, "Methodology of Transdisciplinarity", loc. cit., p. 19.

plinary and it's not the case) but it has to be created by a certain effort of attitude, the Transdisciplinary posture, and it creates the unity in diversity between the Subject and the Object, between interior and exterior, between subjective experience and objective experience, between science and religion, communicating through the non-resistance zone of the hidden third.

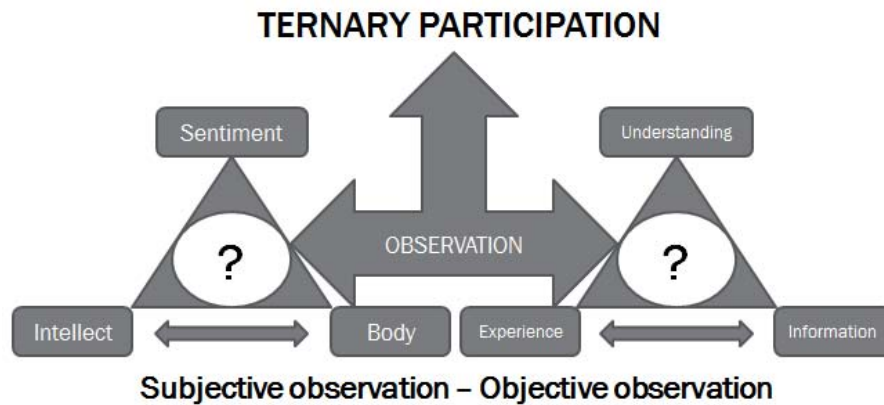


Figure 22.2: The Transdisciplinary approach requires participation to the ternary structured outer reality using the ternary structured inner reality, whereas observation is the hidden third in reconciling the being and the knowledge by feeling and understanding.

In the Transdisciplinary research it has to be emphasized from the beginning.⁹

In the method of observation and how to perform it under the science of methods Transdisciplinarity is, in respect to information and experience.

Fundamentally, the scientific methodology relies on the confrontation between information and experience. The intellectual activity is rather of informational nature, the experience is rather of physical nature. The scientific method also uses the word observation, either to describe the participation of experience or, at best, the confrontation between information, theory or logic and the facts of the experience. This pertains to external, objective observation. In fact, this is one of the requirements of the scientific method- that observation should remain external, without individualization, the same observation for anyone- the same physical experience, in fact. It is the scientific meaning of "objectivity". From the Transdisciplinary perspective, objectivity is more complex than that and so is observation.

At the opposite pole, always following the law of contradiction formulated by Stephane Lupasco, the inner experience is extremely individual- it cannot be replicated¹⁰ and sometimes even shouldn't be. If it can be replicated, it means the inner experience did not take place, as the existence of the new level of Reality of the new interiority is defined by its irreversibility, precisely because implies the irreversible coming into existence of a level previously absent. This is the area and scope of reli-

⁹See Adrian Mirel Petrariu, *Levels of Reality in Social Systems*, Ph.D. Thesis, Babes-Bolyai University, Cluj-Napoca, 2013, p. 24.

¹⁰Basarab Nicolescu, *Poetical theorems*, loc. cit, p. 60.

gious, mystic, and artistic experience. As the scientific method denies the subjective reality and disguises often the subjectivity in interpretation, this very often denies the objective reality: the danger of reductionism goes both ways, or more precisely, goes three ways. Of course, denying them it does not mean subjective and objective cease to exist; it only represents a specific polarized manifestation of subjectivity. If the scientific method tends to think observation and physical experience the same thing, the inner experience in its turn tends to consider observation and psychic activity the same thing, generally under the name of introspection.

Reconciling the subjective and the objective requires the non-resistance zone where the coherence of the Universe is coming from, beginning with the ternary structure common to both. This coherence expressed in the objective unity of knowledge and the subjective participation of the researcher creates the challenge of complex reconciliation: being Transdisciplinary.

The structure of Reality is unique and ternary at the same time, being the ultimate expression of the included third in the first place. Expressing its complexity, its energy is also dynamic: from 3 to 1 and 1 one to 3, movement mediated by the contradictory duality. As the structure of Reality is complex and objectively ternary, the subjective participation has to be also ternary and complex. The objective complexity includes precisely the relation between the interior and the exterior, between the Subject and the Object.¹¹

The path of being goes from nothing to ternary and from ternary to nothingness. By not confusing information, experience and observation and establishing the Transdisciplinary relation between the Subject and the Object (Figure 3), we find that thinking,¹² depending on the being, has multiple possibilities in terms of levels of Reality:

- Experience: no thinking; (reductionism A)
- Information: thinking 1- unary logic; (reductionism non-A)
- External observation (discontinuity and contradiction): thinking 2- binary logic; (anti-reductionism)
- Internal observation (the energy of the included and the hidden third): thinking 3- ternary logic; (trans-reductionism)

While there cannot be a general recipe for acquiring Transdisciplinary being, and therefore, Transdisciplinary knowledge, precisely because of individuality of the inner experience which makes it irreproducible, observation is nevertheless the general ingredient of the individual recipe.

From the Transdisciplinary perspective as a methodology of doubt¹³, aspiring towards openness and amazement required for reconciling the knowledge forever open with the limited amount of resources of the human life, the key is realization

¹¹Transdisciplinarity establishes a new relation between the Subject and the Object. Idem, "Methodology of Transdisciplinarity- Levels of Reality, Logic of the Included Middle and Complexity", loc. cit., p.29-30.

¹²An interesting approach on the levels of thinking was made in a study of R. Kegan: Magical thinking, Concrete thinking, Cross-relational thinking, Systemic thinking, Trans-systemic thinking. Even though it only covers unary and binary thinking levels from the perspective of this paper, it is based on the same principles. The study found most of the subjects operating under unary thinking. See Robert Kegan, *The evolving self*, 1982.

¹³See Basarab Nicolescu, Michel Camus, *Rădăcinile libertății*, Curtea veche, București, 2004, p. 70.

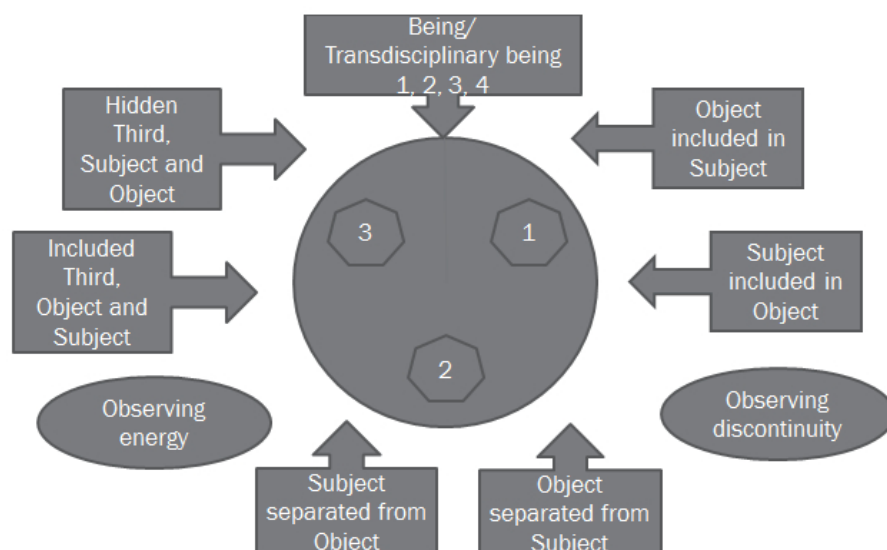


Figure 22.3: The degrees of reason depend on the integration of the logic of the included middle, which ensures the transition from one level of Reality to another: the levels of perception of the Subject correspond to the levels of Reality of the Object when the thresholds of observation correspond to the thresholds of Reality.

by verification. The observation needed for verification has to take into account the Transdisciplinary methodology under three aspects: the definition of Reality and what is real, the levels of the Reality and the logic of the included third which ensures the transition between the levels.

The Reality and what is real from the Transdisciplinary perspective has been extensively described;¹⁴ we are going to focus here on the practical relation between observation and imagination. This relation is a third in relation to the contradiction between real and Reality,¹⁵ between what can be known and what cannot, both subjectively and objectively, becoming a vertical axis¹⁶ between the resistance and the non-resistance zone. This axis creates axiology and the vertical dimension of knowledge, between revelation and reductionism (see Figure 4). Both revelation and reductionism solve the contradiction between information and experience, but one solves it by increasing complexity and openness along the levels and the other by decreasing it. The unity of knowledge can be achieved objectively *in vivo*, by verification of observation or subjectively *ex vivo*, by the reduction of the prejudice, *idée fixe*, belief. Under the logic of the included third, this verticality depends if the

¹⁴Basarab Nicolescu, *Ce este realitatea?*, loc. cit.

¹⁵Idem, *From Modernity to Cosmodernity- Science, Culture and Spirituality*, Chapter "The Hidden Third and the multiple splendor of being", SUNY Press, 2014, p. 203.

¹⁶"It is interested to note that the combined action of the ontological, logical and epistemological axioms engenders values. Therefore, there is no need to introduce values as the 4th axiom." Idem, "Methodology of Transdisciplinarity", loc. cit, p. 17.

THE VERTICAL DIMENSION OF KNOWLEDGE

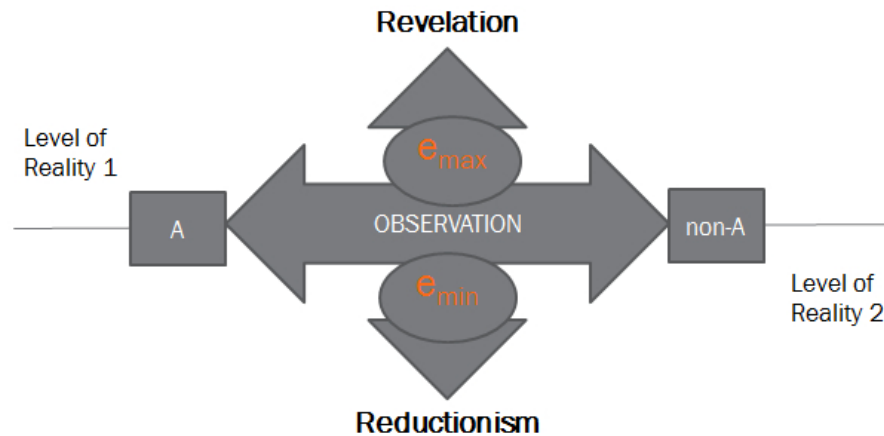


Figure 22.4: The absence or the presence of the hidden third determines the path of maximal resistance or the path of minimal resistance in observing Reality.

hidden third is about more presence or about more absence. The act of symbolic seeing, as concrete expression of the unity of knowledge, corresponds to Reality more or less depending on the ratio between observation and imagination.

Transdisciplinarity studies what is across the levels of the Reality, what is between them and what is beyond them. Therefore, from the Transdisciplinary perspective, verification of the Reality depends on the level of the Reality where it takes place. The definition of Reality has to be completed with the method of realistic observation. Methodologically speaking, when observing something it should be established:

- Where it is (level, between, beyond);
- The laws of that system;
- Its energy- what it does actually or potentially;

This method of transition from the objective definition of Reality to subjective definition of the reality of something, from what is Reality in general to what is a particular Reality, can be applied to observe any and all phenomena, from quantum particles to human beings.

Let us apply it as example to observation itself in order to determine its reality. Observation is in, between and beyond: a real Transdisciplinary epitome. We find three types of observation related to Subject, each with its place, laws and energy:

- External, physical observation- levels/ degrees of exteriority;
- Observation in between of the dynamics of interior-exterior (something goes in, something goes out);
- Internal, metaphysical observation- levels/ degrees of interiority;

THE SPIRITUAL EVOLUTION OF THE RESEARCHER

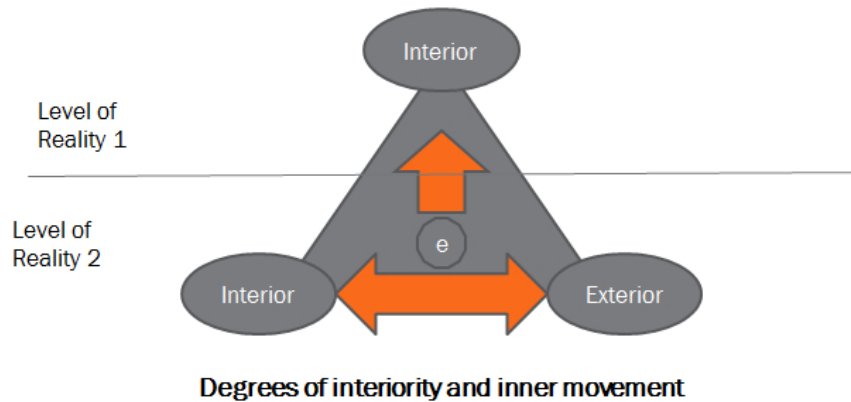


Figure 22.5: The binary thinking divides Reality in interior and exterior; the ternary reasoning divides Reality in degrees of interiority and exteriority.

Between the reality of knowing where it is and what it does and the real of not knowing what it is and what it does, there is this contradictory, mutually exclusive, middle area where we can only observe one or the other, where if we know what it is we don't know what it does and if we know what it does we don't know what it is. Being Transdisciplinary aspires to know the open unity of the world, in which the human subject exists, so it has to use both the excluded middle logic and the included middle logic, mediated by the hidden third, in order to explore the objective complexity and obtain Transdisciplinary understanding. The Transdisciplinary relation between the study of the Object and the study of the Subject makes the ancient adage "Know Thyself" obligatory for being Transdisciplinary and for Transdisciplinary knowledge and understanding.¹⁷ We find therefore, by the logic of the included middle, three types of observation related to the Object:

- Observation of the world (ex: Classical Physics);
- Observation between (ex: Quantum Physics);
- Self-observation (ex: Spirituality);

Observation, its levels and its relations are showing us that the levels and degrees of interiority are crucial when it comes to being Transdisciplinary. The simple division between interior and exterior pertains to binary thinking, but the ternary algorithm of energy postulates the interior more interior than the interior and more exterior than the exterior, as it occupies a third position, both interior and exterior to the contradiction between interior and exterior (see Figure 5).

¹⁷"There is a biunivocal and contradictory correspondence between the three postulates of the modern science and the three postulates of the Tradition. This is why the modern science and the Tradition are isomorphic: the study of the Universe and the study of man support each other". Idem, Poetical theorems, loc. cit, p. 61.

The vertical dimension of being, knowledge and understanding creates for the Transdisciplinary researcher the spiritual need for personal evolution¹⁸ in order to achieve the Transdisciplinary being.¹⁹

22.3 Conclusions

Observation must not be collapsed subjectively with intellectual activity, emotional state, or physical perception.

Observation must not be collapsed objectively with information, experience, or verification.

Depending on the situation of the being related to collapse, the thinking takes place on different levels of Reality, with all the consequences implied.

In the logic of the energy, observation plays often the role of the Hidden Third.

There are levels of Reality of observation, levels of the Object and levels of the Subject.

There is no Transdisciplinary knowledge without Transdisciplinary being and there is no Transdisciplinary understanding without self-observation, observation of the world and what's between them.

Self-observation is performed realistically only under rigorous methodology.

About the Author



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¹⁸On the practical specific method used in the practice of self-observation see *A.R. Orage Group talks as recollected by F. Schneider, R. Morris, and others*, Magisteria Publishing House, Bucharest, 2014, p. 17.

¹⁹“The Transdisciplinary approach of Reality allows us to define three types of meaning: Horizontal meaning (i.e. interconnections at one single level of Reality). This is what most of the academic disciplines do; Vertical meaning (i.e. interconnections involving several levels of Reality). This is what poetry, art or quantum physics do; Meaning of meaning (i.e. interconnections involving all of Reality, Subject, Object and Hidden Third) This is the ultimate aim of Transdisciplinary research.” See Basarab Nicolescu, *From Modernity to Cosmodernity- Science, Culture and Spirituality*, loc. cit., p.201.

CHAPTER 23

Virtue Ethics as Reflected in Romanian Church Mural Painting

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This chapter aims to discover the unitary sense of some pre-Christian philosophic moral ideas represented in the outer mural paintings of Moldavian monasteries and churches from XV and XVI centuries, which are still fascinating by their message and chromatics numerous people looking for truth, goodness and beauty. This research assumes a step forward in the trans-disciplinary dialogue between theology and philosophy, between church and culture, between divine and human revelations, teonoma and autonoma thinking, thus creating rational and logical bridges towards a common action having as final goal to get the happiness through a virtue thinking and life.

Keywords: Virtue ethics, Byzantine iconography, mural painting, Moldavian monasteries.

23.1 Introduction

The outer paintings of Moldavian churches and monasteries, unique patrimony under UNESCO patronage, represent a continuous searching source from various perspectives: theological, scientific, artistic, and academic, with a huge bibliography under extension, but also as an attraction for Romanian and foreign tourists. One may affirm that we are dealing with a community and communion of people and concerns, historical and trans-historical, related to these masterpieces of spiritual, cultural and transnational identities.

The above mentioned community was formed by the founders of these vestiges, builders, painters, decorators, anonymous or known material and spiritual supporters of these monuments, since old times of Stefan the Great king and his son, Petru Rares, until today, including researchers, and inspired writers and artists. According to Bogdan Bratu opinion, Moldavian medieval paintings represent for those who accept divine revelation: “an icon of Moldova realm in 15-16 centuries”, for Paul Henry they represent “the last renaissance of Byzantine art” [1], and for Constantin Ciobanu: “a treasure on prophecies of antiquity wise” [2]

This topic remains actual and is based on a vast bibliography, including sound personalities from various domains: philosophy [3-10], religion [11-15], artistic [16-

24].

The innovative aspect of this study resides in the attempt to maximize the pre-Christian thinking by putting in the light of divine revelation as it is expressed in the iconographic painting in general, and in Moldavian mural painting in particular, as a compulsory step in preparing humanity for receiving values of truth, beauty and virtue, as they are embodied in the person of God Son - Jesus Christ. Such an approach is very actual, since today is highly necessary a peaceful and sincere dialogue to counteract the hard attack of neoliberal, neomarxist, neo-nazy, or nihilist ideologies.

In this context, the paper aims to discover the unitary sense of some pre-Christian philosophic moral ideas represented in the outer mural paintings of Moldavian monasteries and churches from XV and XVI centuries, which are still fascinating by their message and chromatics numerous people looking for truth, goodness and beauty as major values of virtue ethics.

23.2 Byzantine Iconography

The outer and interior paintings of most Romanian old monasteries and churches belong to Byzantine style. The iconographic Byzantine program, either interior or exterior, is more than rich, but also very diversified, following the rules imposed by the textbook of iconography norms of Dionisie Defurna [12], but also with some painting licenses at choice of founders and decorators of that time.

In Figures 1-6 some iconographic items are presented, painted on the outer facades of several famous Moldavian monasteries and churches.

One of the most renowned monuments in the world is the Voronet monastery (figures 1-2), known also as the 'Sixtine chapel of East', due to the 'Doomsday' fresco painted with the famous pigment 'Voronet blue' (Fig. 3), of which composition remained a mystery until today. It is supposed that this pigment contained a blue stone, a copper mineral – azurite, probably provided from mines from China, France or Africa.

What is characteristic to Voronet painting is not only the nature of the blue pigment, but also its resistance in time and in hard climate conditions. This could be assessed to an original working technique, in which a traditional plum brandy was used both in the composition of pigments and of mortar.

Surprisingly, the monastery paintings also include a picture of the '12 zodiac signs' near Jesus Christ (Fig. 4). However, this esoteric message is clear: two angels pick up the constellations from the canopy of heaven in parchment-like rolls. This fresco actually highlights the dramatic difference between our epoch and the eternity.

Some important historical events are represented on the church walls, like the 'Constantinopol siege' (Fig. 5), or images including normal people life among the saints.

Indeed, even very scrupulous in respecting religion canons, originality of these paintings is manifested by the presence of negative personages like otoman conquerors and also of people dressed in popular garments among emblematic figures of the Holy Scriptures. An example is given in figure 6, where the Saint Trinity is represented in a vertical plan, while in horizontal lines there are three levels of diversified scenes of human and sacral origin.



Figure 23.1: Voronet monastery.



Figure 23.2: Apostol facts, Voronet.

23.3 Virtue and Happiness

Since the very beginning and also in our days people were looking for good, virtue and happiness. Both before and after Christ, pre-Christians and Christians tried to practice the belief in God, love for humans, hope, abstinence, justice, wisdom, manhood, heroism, friendship, patriotism, etc.

The antique wisemen may be considered as pre-Christians, similar to our Geto-Dacian ancestors, which represent a continuous source of strength for getting virtues, possibly by continuous practice of moral acts. In a wider sense, those who are looking for embellishing their soul and life might be called monks (Cali Agati), that is people who are living the Goodness and Beauty. This is the reason why the philosophers were considered as prophets of God.

In the well-known work, “*Etica nicomahica*”, chapter 7, Aristotle declared: “happiness is an activity in conformity with virtue and is unified with rationality, and a



Figure 23.3: The Doomsday.



Figure 23.4: The 12 zodiac signs.



Figure 23.5: Constantinople Siege, Voronet.



Figure 23.6: Saint Trinity, Voronet.

virtue man will die for his motherland”, [10].

The desire to practice virtues is as old as the human being, but to desire is different from to be able. After the Christ embodiment, after His death and renaissance for all the people, the virtues became biddings, but also conditions for getting the heritage of God Realm. The saints, angels, and above all, the Saint Virgin Marie are virtues personalized. They embody all the virtues and smooth the way for those who are willing to get these virtues from God. They are friends in prayer and in helping the people in need.

By painting the antiquity philosophers and prophets the master icon painters intended to express the thirst of virtue and happiness that might be fulfilled by divine revelation, exemplarily lived by the Saint John Scarifier in the VIIth century, as a testimony that this is possible even today, and accessible to those who are looking for happiness in the right direction. The teonoma thinking of icon painters strengthens the belief in the rationale limits, which, illuminated by the Gospel, directs the soul towards the true, beauty and completion. The autonoma thinking as an expression of human freedom is also positive, being an imperfect experience of the happiness search.

Relevant in this context is the mural painting of Sucevita monastery (Fig. 7), which is the best conserved out of group of Moldavian churches with outer painting. Its famous painting of the Saint John Climax from the North side is the vastest Romanian iconographic interpretation of the belief in a first doomsday after the death (Fig. 8). Here is represented the fight between Good and Bad, in the attempt of humans to advance towards perfection for getting back the initial appearance lost by falling down in the sin.

To get these virtues it is firstly need of a deep belief in God and His help, then to clean up from all sins and passions such as through the man into the dragon mouth as it is represented in the doomsday scene or a heaven stair. To get virtue a continuous endeavor is compulsory, and the Saint Trinity is the inexhaustible spring of virtues, who reward the virtuous people, and punish those who are lazy in getting the virtues. The lack of virtue and growing sins is punished as reflected in the Doomsday scene (Fig. 3). Sometimes animals are models of virtue for man, as it is also depicted in the Doomsday scene from Voronet church.



Figure 23.7: Sucevita monastery.

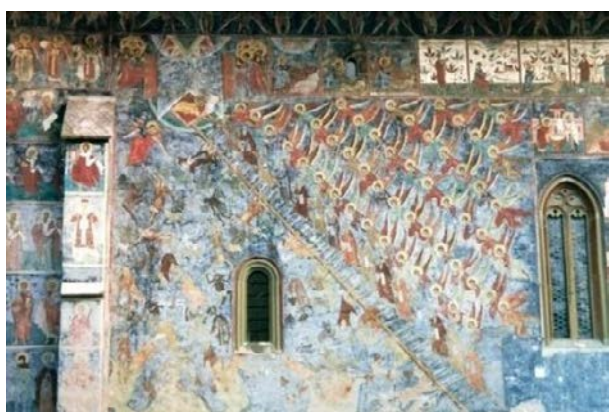


Figure 23.8: The Virtue Staircase, Sucevita.

23.4 Antique Wisemen and Philosophers Propheying the Embod of the God Sun

What is highly surprisingly to these painters is the frequent presence of the images of antiquity philosophers painted on the majority of outer Moldavian churches. At the Sucevita monastery, for instance, a number of 14 famous personalities are painted: Porphyrios, Goliud, Umid, Vason, Ason, Astakoe, Udi, Selim, Sophocles, Plato, Aristotle, Pythagoras, Sivila and Saul (Fig. 9). Except for Soul, all the other have inscriptions or prophecies written on phylacteries. Other philosophers are found on the Voronet monastery: Szmovagal, Socrates, Thucydides, etc.

The content of some prophecies written on phylacteries has been deciphered by Vasile Grecu [12] at the beginning of 20th century, as in the following images.

Porphyrios represented in Voronet and Sucevita churches: “With the God word,



Figure 23.9: The tree of Iesei with figures of antiquity philosophers painted on the South wall of Voronet monastery.



Figure 23.10: Porfirie: left - Voronet , right - Sucevita.

the heavens have strengthened...” Psalm 32 of David, verse 6, (Fig. 10).

Pythagoras: “The Great God will go down between people and will live two hundred years...since the beginning” (Fig. 11).

Thucydides: “Not searched, not spoken and not ruined is the Divinity made-up of three faces...” (Fig. 12). It is really impressive this prophecy and profound understanding of the Trinity.

Socrates: “I hope to be born from Virgin and to revive from death...”. This is another remarkable prophecy about the birth and revival of Jesus Christ (Fig. 13).

Plato: “Christ will be born from the Virgin Marie. I believe in Him. During Constantin and Helen empress times my bones...” (Fig. 14).

Sivila empress: “From a pure Virgin without bridegroom the God will come” (Fig. 15).

Aristotle : “The being of not-created nature will come down, from the pure



Figure 11: Pitagora (Elin [Pi]vogor) - Voronet **Figure 12:** Tucidide - Sucevita



Figure 23.13: Socrate: left – Monastery St. John the New, Suveava, right - Voronet.

Virgin as the God Bride” (Fig. 16).

23.5 Conclusion

Until now there is not a complete and unitary understanding on the persons and philosopher ideas represented on the exterior of Moldavian churches. However, there are some interpretations on these images as a prior step on the dialogue between Theology and Philosophy, between Church and Culture, between teonoma and autonoma thinking, starting from the similar goals of both profane and religious worlds



Figure 23.14: Platon: left – Voronet, middle – Moldovita, right - Sucevita



Figure 23.15: Sevila empress: left – Voronet, middle – Sucevita, right - Moldovita.

to get virtue.

These are reminiscences of the primordial revelation not only of Jewish, but also of Greek and Latin pagan people who were waiting for Messiah.

In this way one may conclude that the pre-Christian philosophers had an important role in preparing the pagan mind about the Messiah coming with their superior ideas at that time about God, about the truth, good, beauty and other virtues.

For a better understanding of this uncommon and fascinating phenomenon represented on the outer mural paintings of the churches of the North part of Moldova, you should go on site, to spent a while within the place spirit and to fill the Holly Spirit of the original founders, painters, abbots and bishops of these monasteries,



Figure 23.16: Aristotle: left – Voronet, middle Moldovita, right – Sucevita.

who take care during 500 years of these monuments for the use of the mankind.

In a hedonist world, running blindly after pleasure and going away from pain, this topic invites to meditation and temperance, looking for the ultimate sense of the existence, as a powerful wellspring for acquiring virtue, possibly by continuous pursuit of moral facts.

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CHAPTER 24

Transdisciplinarity, Mechatronics and Organizational Learning

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This chapter presents details related on the fundamental approaches for transdisciplinarity learning, based on the innovative potential of mechatronics and the concept of organizational learning. Mechatronics, the result of integration of mechanics - electronics and informatics is the technology of the 21st century. It is the science of intelligent machines and environment for smart education and organizational learning in the knowledge society too. Mechatronics, through its integrative, sinergic character, is an open field that transcends the limits of a single discipline. The mechatronic identity based on the complexity concept is trans-thematic one. The basic elements about Romanian national platform for smart education and organizational learning are outlined too.

Keywords: Transdisciplinarity; mechatronics; education; integration complexity; organizational learning.

24.1 Introduction

The evolution of the society development is closed related on the technology development. It is relevant if the limits are mentioned: the stone technology-mechatronic technology. The shift in the society development from one stage to another was caused by revolutions. As we know, in the literature are mentioned: material revolution, energy revolution, quantum revolution, information revolution and mechatronic revolution [12, 25]. The last three revolutions marked the XXth century.

Stephen Hawking, English theoretical physicist said, the 21st century will belong to complexity [1,2]. The complexity is closely related on the idea of non - separability, which “seems to be a fundamental principle of all that is profound in the world” [1, 2].

Consequently, research and education of the future must be shaped by the force lines of complexity and non-separability. So that, in that context to be transdisciplinary is a major need. Of course, for that we must learn transdisciplinarity[1, 2, 19, 25].

On the other hand, Russell Ackoff one of the pioneers and promoters of the

systemic thinking concept underlines that effective research is not disciplinary, interdisciplinary, or multidisciplinary it is transdisciplinary.

Systems thinking is holistic, it attempts to derive understanding of parts from the behavior and properties of wholes, rather than derive the behavior and properties of wholes from those of their parts. Disciplines are taken by science to represent different parts of the reality we experience.

But disciplines do not constitute different parts of reality; they are different aspects of reality, different points of view. Any part of reality can be viewed from any of these aspects. The whole can be understood only by viewing it from all the perspectives simultaneously. The separation of our different points of view encourages looking for solutions to problems with the same point of view from which the problem was formulated.

The last three revolutions marked the XXth century. As Quoting Einstein: "Without changing our pattern of thought, we will not be able to solve the problems we created with our current patterns of thought." When we know how a system works, how its parts are connected, and how the parts interact to produce the behavior and properties of the whole, we can almost always find one or more points of view that lead to better solutions than those we would have arrived at from the point of view from which the problem was formulated. For example, we do not try to cure a headache by brain surgery, but by putting a pill in the stomach. We do this because we understand how the body, a biological system, works. When science divides reality up into disciplinary parts and deals with them separately, it reveals a lack of understanding of reality as a whole, as a system (Russel Ackoff).

Systems thinking not only erases the boundaries between the points of view that define the sciences and professions, it also erases the boundary between science and the humanities. Science consists of the search for similarities among things that are apparently different; the humanities consist of the search for differences among things that are apparently similar. Science and the humanities are the head and tail of reality-viewable separately, but not separable.

In the context, it is easy to understand that: "Promoting the complex and transdisciplinary thinking in structures, programs and areas of influence of the University, will enable the progress towards its mission forgotten today – the study of universality" [13, 14, 15]. The basic problems for transdisciplinarity learning are: the system thinking development; team work/learning; organizational learning; integral education concept promotion; the integration-complexification process in the nature, technology and society understanding; the role of information in the integration complexification process: information carriers, information link, information kinematic chain, information field, sensitive information etc. The above details are in fact the main features of the smart people, the result of the smart education. As we know smart/intelligent people, intelligent management and intelligent technologies are the main pillars of the smart cities/communities [12, 25, 28].

Based on the world experience in the field of mechatronic technology and education and national experience of more than a quarter of century, in the paper are outlined solutions for the above-mentioned problems, based on valorization the innovative potential of mechatronics.

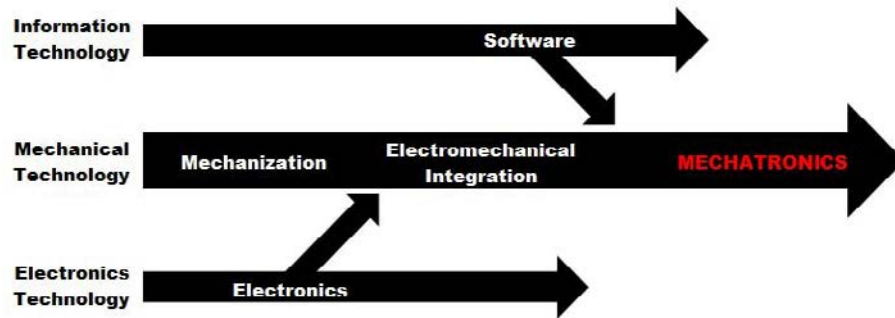


Figure 24.1: Technological flow towards mechatronic integration.

24.2 Mechatronics, the Technology of the 21st Century

24.2.1 Mechatronic Concept

The mechatronic word, patented by Yaskawa Electric Concern in Japan at the beginning of the eighth decade of XXth century, was used to describe the technological fusion of three major engineering fields: mechanical- electrical, electronics- automation, computer science. [10, 12, 17, 27]. All high-tech products are mechatronic ones. Some representative examples are: the modern automobile, the CNC machines, the computing technique, the telecommunication technique, the research equipment, the robots, the biomedical apparatuses, the electro-household appliances etc. Practically, mechatronics is present in all fields of activity, including agriculture and construction.

The evolution in technological development has led to the emergence of mechatronics. This development is suggestively highlighted in Figure 24.1. [3, 4, 10, 12].

The mechanical technology developed towards mechanization is the backbone of mechatronics. The progress in the field of electronic technology, the emergence of integrated circuits, small, cheap and reliable, allowed the integration of electronics into mechanical structures. This is the first step towards integration: electromechanical integration.

The next step in integration was due to the emergence of microprocessors. Having the same constructional features as integrated circuits, microprocessors could be integrated into previously built electromechanical structures. Thus, they can retrieve information about their internal status and about the state of the environment, process this information, and make decisions about how the system behaves.

The concept of mechatronics is highlighted in Figure 24.2. The scheme illustrates that the traditional, fragmented approach, based on which mechanical engineering studies specific problems of mass motion, is no longer possible in the conceptual work; electrical-electronics engineering studies specific electron motion issues, and the automation engineers, the computer scientists study the information motion specific issues. The three movements existing in the structure of a mechatronic product cannot be separated.

If in the traditional technology the basics are the material and the energy, in mechatronics these two elements are added a third tune-giving component, the in-

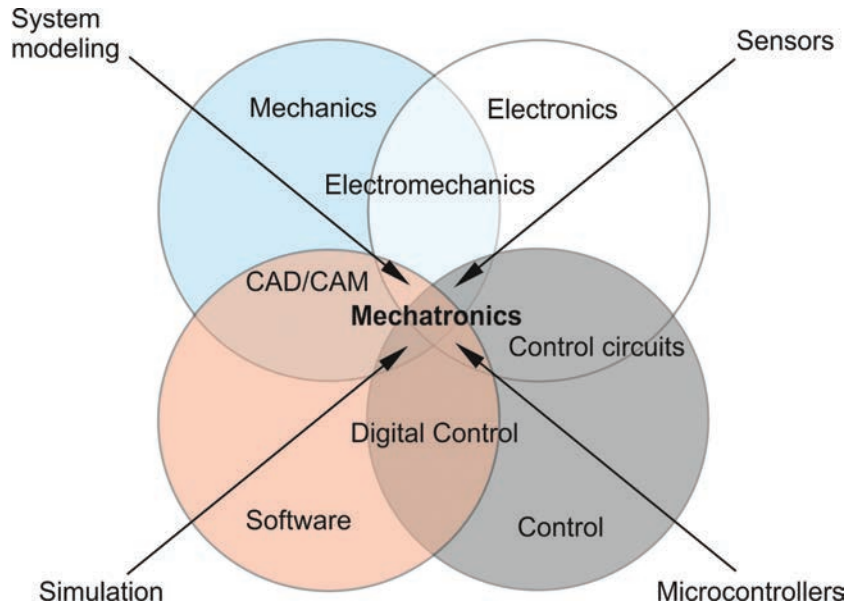


Figure 24.2: The mechatronics concept.

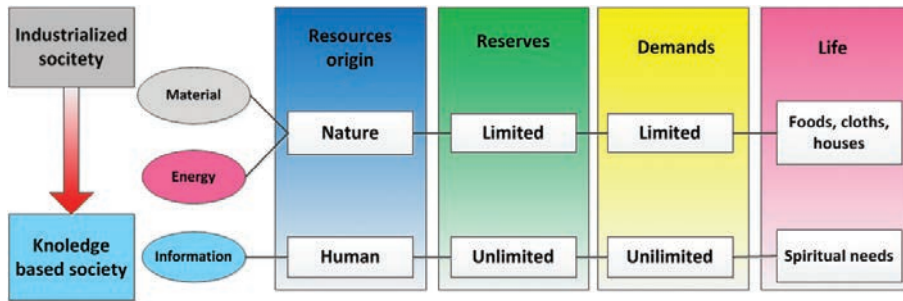


Figure 24.3: The relation between material, energy and information.

formation. This position of information in relation with material and energy is supported by the following arguments: [10, 11, 12, 17]:

- information ensures the satisfaction of the spiritual needs of man;
- only information ensures the increase of the added value of all things;
- information means culture.

Based on Figure 24.3, a comparative analysis of the three components of mechatronic technology can be made [10, 11, 12, 17]. The analysis considers: the origin of the resources, the reserves, the demand and the meaning of life from the three elements' point of view. The analysis conclusions motivate the interest shown throughout the world to promote this technology. Certainly, the intelligent products making

(which incorporates a large amount of information) will increase their functional performance. On the other hand, material and energy resources are preserved in this way. But, by consuming less material and by processing less energy, the pollution decreases. Thus, there are other new valences of mechatronic technology: it is a non-dissipative and less polluting technology.

The integration of information links into the technical systems structure provides them with flexibility and reconfigurability [11, 12, 16, 20, 22].

The comparative analysis of the three elements of mechatronic technology reveals the determinant role of information in relation with material and energy. The value of information does not depend so much on quantity as it does on freshness, since human mind always demands new stimuli.

The value of material and energy depends on how it integrates, and the information value depends on differentiation. Mechatronic technology launched the challenge of sensitive information. The coaches' commercial value, for example, does not depend only on their technical performance. Style, color, design in general have an influence on passengers. Every machine transmits information that stimulates the senses of the human being.

The presence of information links in the structure of technical systems requires small quantities of material and energy; this implies an increase in the operating flexibility and efficiency. In this context, quantitative and qualitative information assessment is a major issue in education, research and technology. The signal is the means of physical manifestation of information. The signals are generated by sensors (artificial sensing organs) integrated into the structure of smart machines and systems.

The sensors materialize the perception function in the structure of an intelligent system. Microcontrollers materialize the brain functions and the actuators (the execution elements) are the artificial muscles. New concepts, both in education, research and technological development, such as: information carriers, information links, information kinematic chains, and information field [3, 4, 12, 18], have evolved in this context.

24.2.2 Mechatronic Education

The mechatronic principles in education focus on the systemic thinking developing, integrating and forming skills for teamwork. In the knowledge society, approaches to the development of systemic, integrative thinking are as important as writing and reading. The knowledge production results from the structuring and integration of information. Of course, the wealth of knowledge and the horizon of knowledge influence an individual's personality, but the ability to structure and integrate this information is predominant in defining the personality of the individual. The defining features of the market economy specialist are flexibility in action and thinking; these skills are formed through mechatronic education. Integrating information links into the structure of mechatronic systems gives them a defining feature, flexibility. In this context, mechatronics education meets the requirements of intelligent education, providing the necessary skills for pupils, students, adults etc. for intelligent integration, smart organizations, smart community etc. Organizations and communities become intelligent and therefore competitive, by learning. Competence is the bridge between man and organizations (institution) and beyond, between organizations and the community. Successful self-programming of individuals, organizations

and communities' results in a qualitative participation on each level, with a positive impact on integrated elements [12, 25, 28]. In intelligent education environments the basic infrastructure by mechatronic platforms is provided. As complex technical systems, these platforms integrate into their structure elements of mechanical engineering (mechanisms, mechanical transmissions, etc.), electrical engineering elements (actuators, sensors, microcontrollers, filters, amplifiers, etc.) and control and informatics elements (control algorithms, dedicated software, human-machine interfaces etc. The specific structure of the mechatronic platforms facilitates the understanding of the integration-complexification process in nature and technology, as well as the role of information and information links in this process. The trans-thematic identity of mechatronics, based on the concept of complexity is argued in the works [1, 2, 12, 19]. In this regard, we can say that the mechatronic platforms are the basic infrastructure for transdisciplinarity learning, with the aim of stimulating creativity and increasing labor productivity in the knowledge production. Mechatronic knowledge means technological knowledge, focusing on methods of producing intelligent systems, services and products [12, 19].

24.2.3 Mechatronics in Engineering Education and Practice

For the engineering practice, mechatronics marked the shift from traditional, sequential engineering to simultaneous, concurrent engineering. Therefore, the concepts of integrated design and design for control were developed. The details on the integrated design methodology are presented in the works [6, 11, 12, 20]. Thus, it is necessary from the conceptual design phase to consider the problems regarding the integration-interfacing processes, the informational links as well as the integration of the control functions into the product structure. In this way, the conventional functions made by the mechanical components are transferred to the electronic control and software components. This increases the constructive and functional performance of products and systems.

The activities promoting mechatronics are expanding more and more, due to a major interest in this field. Approaches in the field of mechatronics require advanced knowledge from multiple engineering fields (see Figure 24.4). They combine kinematics and dynamics, materials science, electronics and communications, the control theory, the information technology, micro technologies, and so on. Mechatronic systems are the result of an integrated design process and therefore are superior to any product achieved through a sequential (classic) design methodology [12, 16, 18, 27].

The integrated approach promoted by mechatronics is essential for the development and manufacturing of cyber-physical systems (CPS) [5] as well as for harnessing the Internet communication potential through internet of things (IoT) approaches [26].

24.2.4 Mechatronic Revolution

Governmental decisions, projects and programs developed in the nineteenth decade (1980-1990) of the last century to promote the mechatronics philosophy in education, research and technological development, generated a wave of renewal that had the character of a real revolution, the mechatronic one. This marked the shift from the

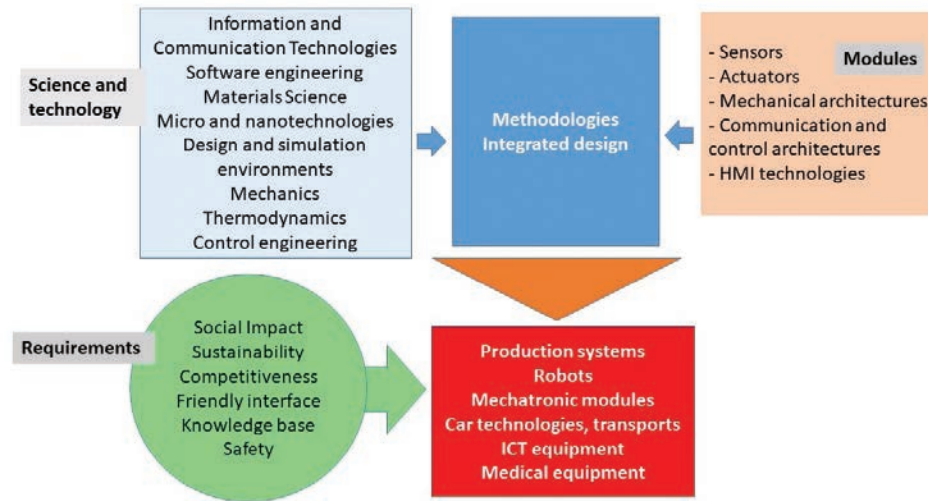


Figure 24.4: The integrated design concept.

information society to the knowledge society. So, two representative examples are presented:

In 1985, The USA Department of Commerce has elaborated a comparative report on mechatronics in the USA and Japan [8]. The report provided support for the decision of the National Science Foundation to finance the National Mechatronics Education Program. The project was coordinated by Stanford University.

A year later, 1986, at the EU-level, Advisory Committee on Research and Industrial Development (IRDAC) [12, 17], analyzing the problems of mechatronics in the EU, concluded that "mechatronics is a major need for European research and educational programs". This decision has stimulated initiatives at a national and regional level to develop projects and programs to promote mechatronics in education, research and technological development. Details of the projects and programs mentioned are presented in the paper [12].

24.3 The Integration-Complexification Process in the Nature and Technology

Integration is a natural process. The nature created forms and structures that promote development in this way. Based on superization principle, the whole, the system, has emergent properties due to the synergistic effect. In the knowledge-based society, efforts to promote the concept of integration in education, research and technology is a major need. Knowledge itself is the result of structuring and integrating information. ICT facilitates these efforts.

In the paper [9] F. Jacob (Nobel Prize in Genetics, 1968) defined the concept of integron, as messenger of integration in human body. In the nature, the integration can be: genetic, through coercion, depending on your choice, random etc. Inte-

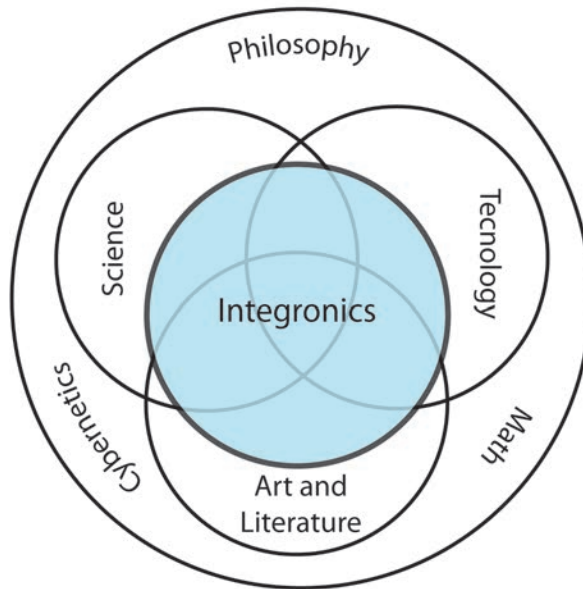


Figure 24.5: Concept of Integronics.

grating subsystems can be: material-energetic dominant or functional-informational dominant. A. Restian, in the book [21] defined the concept of Integronics as The science of integrated processes and hyperintegrated systems, as the human body is.

It takes account of the indissoluble unity of the world in which we live and the need for unique perspectives on the world. The concept is illustrated in Figure 24.5.

Unity: science, literature and art, technology, takes place in the framework of mathematics, cybernetics and philosophy. Basis of integronics is not only the world unit but also the gnoseologic drive unit, of the subject knowledge of this world. Because there is no physical, chemical and even of scientific or artistic knowledge, human knowledge is unitary. The work of L. Lederman (Nobel Prize in Physics, 1988) related on the ARISE Project, 1995-2000 (American Renaissance in Science Education) was concerned with the approaches to train the teachers of physics, chemistry and biology in order to integrated teaching of the subjects. Studying the inextricable links between different objects and phenomena, integronics is trying to overcome the extremely narrow limits of sciences but cannot replace them. Sciences have been developed as a result of the limited possibilities of man to comprehend the realities of the world around us. Need for progress removed the borders between sciences and the evolution towards interdisciplinarity and after all to transdisciplinarity. In this manner have appeared chemistry-physics, biophysics, biochemistry etc.

Accentuating the limits of fragmented approaches and the need for a global vision, integronics try to avoid such situations, emphasizing more strongly that we need to consider not only the subsystem on which to act, but also his links with other subsystems and finally the suprasystem of which it's a part. Integronics inscribe herself in the context of modern thinking which after all is a global, probabilistic, modeling, operational, transdisciplinary and prospective one.

Integronics conception is one of the great gains of mankind due to the mechatronic revolution. It's very basic principle: the principle of order and systemic organization which is contrary to the second principle of thermodynamics, could be made due to consideration of information. In the formulation of the second principle of thermodynamics information is not considered.

Extremely useful, this process of emergence of interdisciplinary sciences has not been enough to solve complex problems of this unitary world. It is natural, because, being more than the sum of its parts, the unity of the body for example cannot be restored by simply unifying neuroscience with the endocrinology or of psychology with immunology and the world alone cannot be retrieved by a simple unification of astronomy with physics, with chemistry and biology.

Because information is the key element in mechatronics, the impact of technology goes beyond areas of economics, being essential in the social, cultural environments etc.

This explains the great interest in the world to launch initiatives and develop special programs for this area. These approaches reinforce the belief that in the knowledge-based society, cultural relevance depends on technical and technological performances[12, 25].

24.4 Mechatronics and the Learning Organization

The notion of learning organization was launched by Prof.P.Senge from MIT in 1990. In 1991 at MIT was founded The Center for organizational learning. The center developed, and in 1997 became Society of the Learning Organization [23, 24].

Senge defines the Learning Organization as an organization where people continually expand their capacity to create results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together.

It is easy to understand that, as the world becomes more interconnected and business becomes more complex and dynamic, work must become more "learningful". It is no longer sufficient to have one person learning for organization. The organizations that will truly excel in the future will be the organizations that discover how to tap people's commitment and capacity to learn at all levels in an organization [Senge, 2006], [23, 24]. Traditionally, productive organizations have been viewed as center of work.

However, The Learning Organization sees the productive organization as not only a center of work, but also a center of learning.

As business organization, schools are learning organization too. Dimensions of the learning organization are:

Individual level: The learning organization is a place of continuous learning and learning becomes a conditioned reflex, a habit.

Group level: Teams are encouraged to reflect on how they work, not only so that accomplishments can be celebrated but so that needed improvements can be introduced.

Organizational level: At the level of the organization, learning organizations connect learning to organizational transformation; learning is about developing the organization itself.

In the context of challenges for smart cities building, a new dimension is added

to the learning process, that is: *Communities level*. The smart city is a *Community of the learning organizations*. *The Smart Country is the country of the learning communities* [25, 28].

P.Senge defines the discipline of the learning organization: Personal Mastery, Mental Model, Shared Vision, Team Learning and System Thinking.

The discipline consists on a body of theory and technique that must be studied and mastered to be put into practice. A discipline is a developmental path for acquiring certain skills or competencies.

Personal Mastery Organizations can't learn unless their members begin to Learn and develop their personal abilities to achieve desired results.

Personal abilities and competences mean to be active able to, to have a creative attitude toward life, to live actively and not to be passive.

It is the discipline of continually clarifying and deepening our personal vision, of focusing our energies, of developing patience, and seeing reality objectively. [23, 24, 25].

Mental Model Mental models determine how a person thinks and acts. Even though people always don't act according to their mental models, their behaviors are based on a mental image [23, 24].

In the learning organization, mental models are the discipline of consideration, discussion, dialogue and study. With this discipline people try to reach some agreement about suitable and realistic mental models.

The deeply ingrained assumptions, generalizations, and even pictures or images that influence how we understand the world.

Shared Vision Consists of the capacity to create a shared image and view of a future which we pursue it. A collective experience which is the total of each participant's personal vision.

Senge believes that action and reaction with people shape a shared vision which created only via the awareness of organization goals and compatibility between individual visions and developing these visions, towards general purpose.

Team Learning As Senge says, the world is full talented people, but it is important that they should know how to work and act together. Conversation and practice are the two important components in team learning.

Team learning is seen to be crucial because team, not individuals, are the fundamental teaching unit in modern organization[23, 24, 25].

System Thinking Systems thinking is a way holistic. It is a framework that emphasize on understanding of internal relations of phenomena, not on identifying them one by one.

Senge sees systems thinking at the heart of his "learning organization" models, where all of organization members develop an understanding of the whole rather than just fractional parts of organization in terms of structures, processes, thinking and behavior.

Analyzing the requirements of the five discipline of the learning organization it is easy to understand that mechatronics is true environment for smart education and organizational learning. The mechatronic platforms are the basic infrastructure for such environments. The specific approaches are appropriate for all the levels of education, since kindergarden to adult education [12, 25, 28].

24.5 Romanian National Platform for Smart Education and Organizational Learning

Mechatronic philosophy developed in Romania since 1991 by developing the branch of mechatronics in engineering in the main technological universities from Brasov, Bucharest, Cluj-Napoca, Craiova, Galati, Iasi and Timisoara [12, 28].

In October 1999, were launched the postgraduate courses on Technological education for the teachers from gymnasium and secondary schools. The educational program included mechatronic subjects. On the other hand, the Departments of mechatronics from universities, in cooperation with Festo Romania developed training courses for specialists from industry.

Festo Romania is the representative of Festo Germany, which is the main logistic support for the International Olympiad of Mechatronics.

As a result of cooperation at the academic level in education and research activities too, along of a quarter of century (1991-2016) the National Mechatronic Platform was developed [12, 25].

It is conceived as a “*national mechanism which aims to activate material and human resources on a local, regional and national level, and also to ensure the systemic approach, in a holistic way of dealing with complex problems regarding education and training in the knowledge society*”.

At that stage (the pilot stage) the platform integrates seven Regional Centers of Mecatronics developed on the structure of the Mechatronic Departments of the technological universities from Brasov, Bucharest, Cluj-Napoca, Craiova, Galati, Iasi and Timisoara.

The regional Center founded in Technical university of Cluj-Napoca is the coordinating one. Within the regional Centers will be further developed Virtual Mechatronic Competence Centers.

These will include: virtual laboratories, and libraries, databases, sources of knowledge and other facilities regarding access to knowledge in the field of mechatronics for students, researchers, professors or any other interested users.

After the pilot phase is validated the Platform will be able to extend integrating other universities, organizations, institute or companies. In this way the Platform will become a veritable national company producing knowledge in the field of mechatronics, and the universities will become real Knowledge Factories. For practice and experiments at all the levels in education and training activities the mobile lab of mechatronics and portable one were developed.

The portable lab for mechatronic education makes possible experiments every were and every time being very efficient to stimulate initiative and creativity.

In the last years, 11 universities in the country developed mechatronic departments. Also, The National Institute for Research and Development on Mechatronics and Measurement Technique is integrated in the structure of the National Mechatronic Platform[12, 25, 28].

The partnership of our university with CIRET and Prof.Basarab Nicolescu was very fruitful and helped us to discover the innovative potential of mechatronics for education and research activities too.

Prof.Basarab Nicolescu is Honorary Citizen of Cluj-Napoca since 2007, and Doctor Honoris Causa of our university since April 2008.

Now, The National Mechatronic Platform is the scientific foundation of The National Platform for Smart Education and Organizational Learning. Based on this

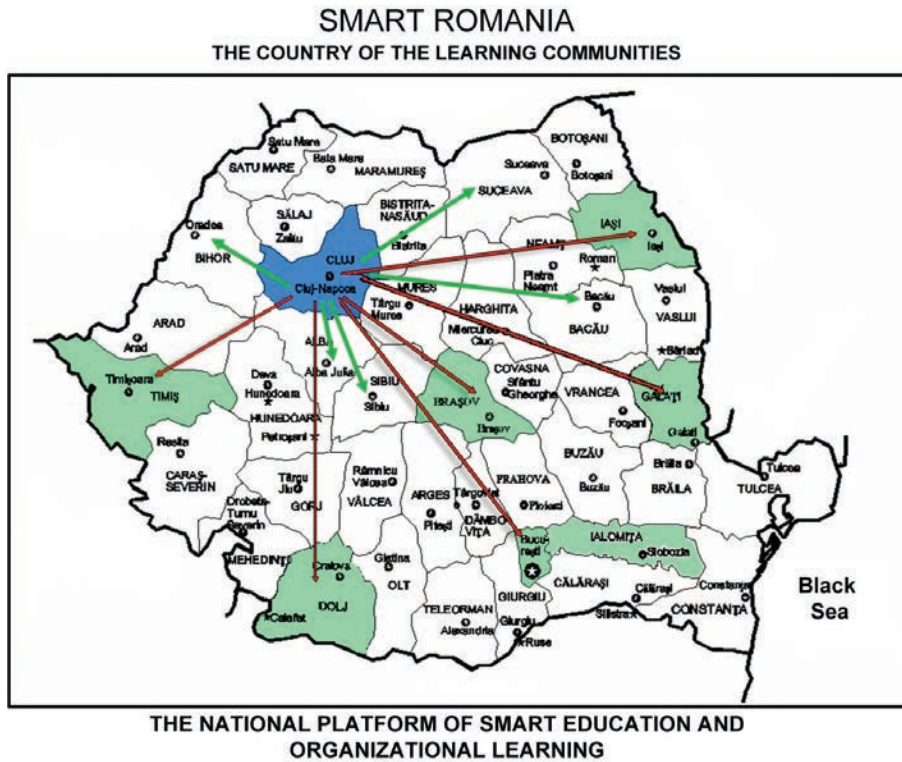


Figure 24.6: The National Platform for Smart Education and Organizational Learning.

scientific support was launched the Project: Smart Romania: The Country of The Learning Communities (Figure 24.6) [12, 28].

24.6 Conclusions

Mechatronics, the XXIst century technology, the integrative philosophy and science of intelligent machine, is the foundation for the development of smart, competence-based educational technologies in line with the knowledge-based society. Mechatronics platforms are the basic infrastructures for intelligent education and organizational learning.

Mechatronics education aims at developing systemic thinking, integrating and shaping skills to work in a team, skills indispensable to the worker in the knowledge production.

The flexibility in action and thinking, the result of mechatronic education, are essential to stimulate initiative and creativity. Flexibility and reconfigurability define the features of the mechatronic technical systems resulting from the integration of their information links into their structure.

In other words, the mechatronic technology, through the integrated approach of the components: material- energy-information makes it possible to materialize the concept of quantum realism.

This context draws attention, both in education and research, on the issues of quantitative and qualitative evaluation of information integrated into the structure of intelligent products and systems. The scientific foundation based on mechatronics and organizational learning concept are major needs for transdisciplinarity learning. Being transdisciplinary asks for transdisciplinarity learning.

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