

Transdisciplinary Chair & Human Plasticity

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Abstract: *The creation of an international transdisciplinary chair is essential in a society that is losing its fundamental values and points of reference. The experience accumulated by the international center for transdisciplinary research (CIRET) over the last three decades under the impetus of B. Nicolescu and E. Morin in France is exemplary in this respect. Echoing many transdisciplinary approaches worldwide, it has initiated a reform of thinking that must be pursued and extended without interruption. Here are two examples that are fully in line with this perspective: 1/the initiative of the PSA (Plasticités Sciences Arts) experimental transdisciplinary research group, which has been working since the charter was established (1994) to set up transdisciplinary practices around the concept of plasticity; 2/ the joint proposal by French and Brazilian transdisciplinary structures to create a Transdisciplinary chair at the university (2007) and contemporary works on the plasticity of living systems in line with these pioneering initiatives (2019–2023). The fact that transdisciplinarity has been established in several academic institutions and that some of the major areas of research undertaken by the PSA group,*

such as the study of posturology in experimental medicine, highlighting essential plastic interfaces in living systems and the study of relationships between art and science, now have powerful ramifications, including institutions, shows us the extent to which plasticity of life and transdisciplinary attitude are complementary. It's a mutation of cultures and consciousness that highlights human plasticity and encourages us to keep moving forward!

Keywords: *transdisciplinarity, plasticity, living systems, art & science, knowledge.*

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1. Introduction

In her statement of intent to relaunch an international transdisciplinary chair within our institutions, habits and customs, Mariana Thieriot Loisel shares her transdisciplinary experience and the work accomplished over the last three decades to break out of silo politics and impose transdisciplinarity as the only viable alternative in a world out of breath and losing its bearings, but above all outlines future paths open to the complexity of human phenomenology while maintaining the transdisciplinary (TD) attitude in its essence.

Under the impetus of key figures such as Piaget, Nicolescu and Morin¹ in France, and of numerous integrative, transversal or transcultural approaches around the world (schools in Zurich and the US, etc.), it has become clear that the reform in thinking engendered by the rise of TD in the wake of Basarab Nicolescu's major works² in the continuity of Lupasco's, has spread to creative, educational, scientific and philosophical practices, consolidating the fundamental building blocks laid down in Locarno, then when the Charter of Transdisciplinarity (TD) was drawn up, which I had the honor of co-signing at the 1st World Congress of Transdisciplinarity in Arrabida (Portugal, 1994)³.

The epistemological openness created by this first TD World Congress was continued in Vitoria (Brazil, 2005, and most recently in Mexico City (Mexico, 2020–2021) in virtual mode due to Covid. This 3rd world congress⁴ was marked by major speeches, strong international participation via ENAH, INAH, Trans-Complexa, CIRET, CETRANS and the UNESCO chair in Florence, and the massive contribution of many of us to symposia, roundtables, and conferences. I led in this context a round-table discussion on the relationships between plasticity & transdisciplinarity with speakers including profs. Frederik Andrès, Mariana Thieriot, Patricia Proust-Labeyrie and Luis Oosterbeek which we will develop further (Sept. 2021). Many examples from different disciplinary fields could enrich this TD corpus and provide avenues of research for the Chair.



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The four-volume conference proceedings currently published are proof of this. Volume IV is co-published as an

¹ Morin, Edgar. *La Méthode I & II*, Le Seuil, Paris, 2008; Debono, Marc-Williams. *La mémoire de la vie — Edgar Morin and Patrick Curmi*, Editions de l'Attribut, Coll. L'adresse à l'autre, 2017.

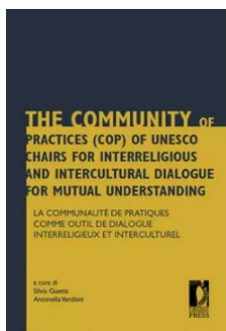
² Pluri/Inter/Transdisciplinarity, pillars of methodology, levels of reality, third party included, TD Manifesto. See Lupasco's works in the references.

³ The original declaration of the TD Charter. Translations in several languages on the CIRET website. <https://www.tercercongresomundialtransdisciplinariadad.mx/declaracion-de-mexico/> (consulted on 26/06/2023).

⁴ Third World Congress of Transdisciplinarity, available here: <https://www.tercercongresomundialtransdisciplinariadad.mx/en/>, accessed on May 6, 2024.

e-book by PSA and CIRET at PlasticitéS Ed.⁵ as a special issue of ‘Transdisciplinary Encounters’ coordinated by Florent Pasquier, Bénédicte Letellier, Mariana Thieriot and me⁶. This close partnership responds to the symposium’s call for continuity and teamwork in the future TD Chair. The lessons to be learned from this specific confined transdisciplinary experience as part of our symposium approach are that the TD dynamic instilled upstream has spread and borne fruit whatever the socio-political context.

2. Transversal models and plastic interfaces: a transdisciplinary approach of human plasticity



A pioneering initiative in line with our project for an international TD chair was carried out by the CETRANS, the CIRET and PSA in 2007. The proposal we launched with Mariana Thieriot, Paul Ghils, Patrick Loisel and Ubiratan D’Ambrosio was to create a TD chair at the university. It was the subject of two publications, one in 2007⁷ in the transdisciplinary human plasticity journal *Plastir*⁸, which since 2005 has published 180 authors in the TD field, and the second in a COP UNESCO book edited by Sylvia Guetta & Antonella Verdiani at PUF Florence in 2011⁹. We mention here particularly Patrick Loisel’s first creation of a Chair in Health and TD at Sherbrooke’s Faculty of Medicine and Health Sciences, and Paul Ghils’s approach to cosmopolitics and transnational/transcultural communication, abundantly documented in *Cosmopolis*¹⁰.

More generally, TD scientific models were introduced in several universities around the world in 2007, taking account of the evolution of their own socio-

⁵ PlasticitéS Editions (PSA website) available here: <https://www.plasticites-sciences-arts.org/editions-plasticites/>, accessed on May 9, 2024.

⁶ Letellier Bénédicte, Pasquier Florent, Debono Marc-Williams & Thieriot Loisel Mariana, *Adopter un langage transdisciplinaire commun face à la complexité du monde*, Third World Congress of Transdisciplinarity Vol IV, PlasticitéS Ed, 2024. <https://www.calameo.com/read/00741761942e31a28050c>.

⁷ <https://www.plasticites-sciences-arts.org/plastir-number-8-092007/>, accessed on May 8, 2024. Debono, Marc-Williams. *Le complexe de Plasticité : état des lieux et immersion*, *Plastir*, The Transdisciplinary Review of Human Plasticity N° 18, 03/2010; Debono, Marc-Williams. *Plasticité de l’esprit et mondialisation*, *COSMOPOLIS* 3/4, 2012.

⁸ *Plastir: The Transdisciplinary Review of Human plasticity* available here: <https://www.plasticites-sciences-arts.org/revue-plastir/>, accessed on May 8, 2024. *Plastir* English abstracts: <https://www.plasticites-sciences-arts.org/plastir/>.

⁹ Mariana Lacombe Loisel, Marc-Williams Debono, Patrick Loisel, Paul Ghils & Ubiratan D’Ambrosio, « Recherche scientifique, plasticité et transdisciplinarité perspectives » in *The Community of Practices (COP) of UNESCO Chairs for Interreligious and Intercultural Dialogue for Mutual Understanding*, S. Guetta & A. Verdiani Ed. (FUP, Firenze University Press, Italy, 2011).

¹⁰ *Cosmopolis, The review of cosmopolitics* available here: <https://www.cosmopolis-rev.org/editorial-en/editorial-2018-1-2-en>, accessed on May 8, 2024.

educative systems and being aware of being prisoners of conceptual or epistemological cages as stated by the ethnomathematician Ubiratan D'Ambrosio¹¹. As established with all these authors, the TD experience is built through a common philosophical reflection aiming to help university researchers and professors to develop TD models and ethical solutions whatever their discipline. As resumed by Mariana Thieriot, this chair calls for an effort to establish a philosophical foundation for the human being and 'we need to ask what the aims of this scientific model are, or its inspiring vision, and what are the means employed by those who conceptualize it at the university, who draw up the axiological dimension of the action. In the same way, we will question those who apply it in the field and are confronted with the paradoxes of philosophical action, of the "praxis" that has made it possible to create in philosophy what is known as "praxeological models" aimed at the transfer of knowledge. Do all these models consider human plasticity and the epistemological consequences of the results of scientific and technological development? Do they refer to an ethic oriented towards otherness or "thinking about the other"? Are they truly transcultural? These are just some of the questions and attitudes that urgently need to be developed in a world beset by exclusion and lack of discernment.'

Indeed, open systems of knowledge are based on the plasticity of the brain of a rediscovered humanity, attentive to others and to the totality of the world, the very opposite of what governs a large part of human relations on the planet today... Yet endogenous plasticity precisely means this ontological crossroads. What's more, it has a universal character described as early as Aristotle, and later by many philosophers like Goethe, Kant, Heidegger or Hegel... This implies that the container (the form) and the content (the object) signify or co-determine each other. Plasticity naturally seals this movement and inscribes it in historicity. There is no domination of one to the detriment of the other to the detriment of the other, but reciprocity. The complexion brought about by the formation of plasticity complexes such as the STP (space- time-plasticity) or NMP (neural-mental-plasticity) complexes is to be understood as a binding or an aggregation. Plasticity is at this level an exact interface role at the noetic epicenter for the NMP complexes here and acts therefore as an exact aggregated center serving as a springboard for the expression of the third. Plasticity is therefore both a ubiquitous fundamental property of matter, articulating in the form of plasticity complexes two mutually irreducible dimensions such as matter and form, or experience and consciousness, and an epistemic concept touching on the ternary in its metaplastic, creative and transdisciplinary dimension¹² (**Fig. 1 & 2**).

¹¹ Ubiratan d'Ambrosio's contribution to Plastir number 43, 10/2016 available here: <https://www.plasticites-sciences-arts.org/PLASTIR/D'Ambrosio%20P43.pdf>, accessed on May 8, 2024.

¹² Marc-Williams Debono, « Le concept de Plasticité, un nouveau paradigme épistémologique », DOGMA (2007); « Le complexe de Plasticité : état des lieux et immersion », PLASTIR 18, 03/2010; « Le concept épistémologique de plasticité : évolution et perspectives », DOGMA, Edition 15, 2021 available here: <https://dogma.lu/wp-content/uploads/2021/05/Dogma.-Edition->

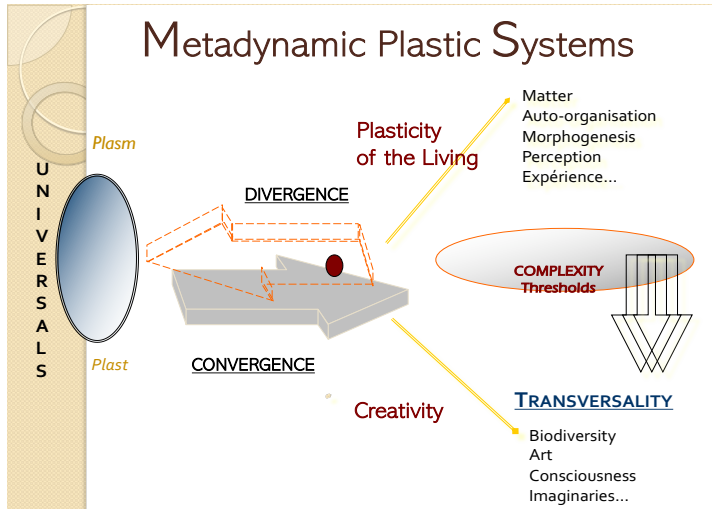


Figure 1: Plasticity of living systems: metadynamics in evolutionary biology and creative processes. Detailed in the figures 2a-2b at the level of processes, this diagram shows how plastic interfaces (from universals to plasmic and/or plastic functions) come into play in living systems during evolution (from self- organization to perceptive processes) and in symbolic thought (imaginary, creativity)

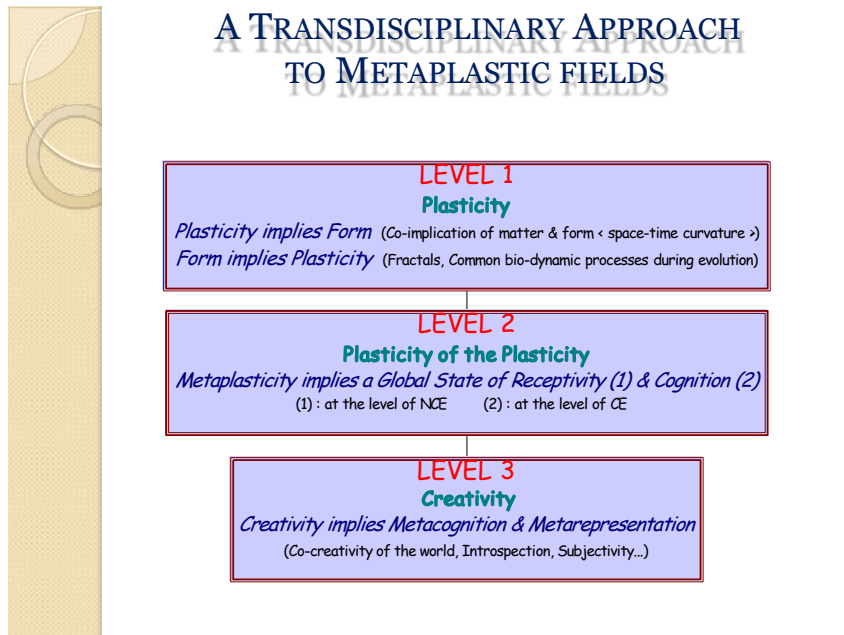




Figure 2: A transdisciplinary approach of metaplastic fields. 2a: The three levels of plasticity. Level 1: primordial matter-form interaction. Level 2: plasticity of the plasticity here described at the cognitive (CE) and non-cognitive (NCE) levels. Level 3: Metacognition and representation states observed during creative tasks. **2b:** *Codex Metaplasticus*. Details of the metaplastic processes showing the PCT (plasticity-creativity- transversality) path necessary to express biodiversity during evolution. It includes major stages in the divergence of kingdoms or the convergence of certain interspecies evolutionary mechanisms across thresholds of complexity. Modified from M.W. Debono (2004), *From perception to consciousness: an epistemic vision of evolutionary processes*, Leonardo, vol. 37: 243–248.

These dimensions are related to the main steps of the plasticogenesis (**Fig. 3**) where plasticity, ubiquitous by essence, needs to become complex¹ and to form an irreversible binding with their apparently contradictory pairs (space-time, brain-mind, subject-object etc.) to be actualized (otherwise it remains reversible, elastic and passive). As previously described, this active binding results from primary interfacing and reciprocal mixing between incoming (informational, for example) and outgoing (conscious or unconscious filter) flows through a common barrier (the subject's body-mind integrity) defining the ART model (Articulation- Reciprocity-Transversality).

¹ From complexus in Latin, i.e., complexion or aggregation (and not complexity).

PLASTICOGENETIC PROCESSES & TRANSVERSAL EMERGENCE OF NOETIC SYSTEMS

GENERIC PRINCIPLE	ARTICULATION	RECIPROCITY SEMIOTICS	TRANSVERSALITY TRANSLATION
FUNDAMENTAL PROPERTY OF THE MATTER	ACTIVE BINDING DYNAMIC LINK	INFORMATIONAL LEVELS ART MODEL	NOETIC EPICENTER THIRD INCLUDED TIERCEITY, T STATE
PLASTIC INTERFACES	'THE PLASTIC CODE OF LIFE'	ONTOLOGICAL CROSSROADS	IMAGINARIES, MEMORIES META-LANGUAGES INDIVIDUATION
UNFORMED-FORMED MATTER-FORM, PERCEPT-CONCEPT, SUBJECT-OBJECT, BRAIN-MIND...	IRREVERSIBLE PROCESSES INSEPARABILITY	CO-SIGNIFICATION PROCESSES / INHERENCY CO-CONSTRUCTION CO-IMPLICATION CO-EVOLUTION	METADYNAMICS TRANSVERSALITY TRANSDISCIPLINARITY TRANSCULTURALITY
PLASTICITY	PLASTICITY COMPLEXES	METAPLASTICITY	PLASTICITY OF MIND

Figure 3: Plastic interfaces as transversal models. This table shows the main steps of the plasticogenetic process from the formation of plastic interfaces to that of plasticity complexes, including the transversal ART (articulation-Reciprocity-Transversality) model. We can note the setting up of ontological crossroads during the co-signification phase, which precedes the metaplastic stages such as metacognition at the cerebral level or translations from the imaginary axis to the imaginary axis implying a ternarity and the emergence of noetic centers. Table modified & updated, initially published in M.-W. Debono (2013), *Perceptive Levels in Plants: A Transdisciplinary Challenge in Living Organisms Plasticity*, *Transdisciplinary Journal of Engineering & Science (TJES)*, Vol. 4:21 – 40.

Founded by the in-between, the formation of plasticity complexes is essential at the anchor point of irreducible dimensions and may contribute a transition towards the T state. Following the plasticogenesis presented as transversal or TD model in Figure 4, this ternary state responds to the lupascian notion of third included where plasticity plays this key role at natural interfaces mutually co-signifying. It has the potentiality to change the observed level of reality due to its impermanent nature and the metaplastic cycle including feedback loops that could be generated by a jump from one to another level of reality or the development of areas of non-resistance¹. This transdisciplinary framework shows the

¹ Nicolescu, Basarab. *Nous, la particule et le Monde*, Le Rocher, 2nd Ed., 2002. Nicolescu, Basarab. *Manifesto of Transdisciplinarity*, Suny Press, 2002; Nicolescu, Basarab. *La transdisciplinarité*, Le Rocher, 1996; Nicolescu, Basarab. "Methodology of transdisciplinarity, levels of reality, logic of the included middle and complexity" in *Transdisciplinarity bridging natural science, social science,*

driving force and catalytic potentiality of plasticity in transversal models like ternarity and raises the question of the origin of the transition from an informed to form and the role played by plasticity in evolutionary processes.

This is what is at stake in the development of the epistemic concept of plasticity¹ and the consequences to be drawn from it in terms of our knowledge of the world in which we live (**Fig. 1 to 3**). The epistemic nature of human plasticity reflects therefore both the interiority of matter and the birth of form co-signifying all the living, the emergence of consciousness and art as the privileged expression of the poetry of existence². As a result, plasticity is an active process that is expressed through different plastic interfaces which, by bonding in the form of plasticity complexes³, become irreversible, rather than simple system properties such as malleability or elasticity, which are functional and reversible. As was shown in the 1990s, this involves a fundamentally different mechanism in which plasticity plays the role of an included third party within a 1-1 relationship between two dimensions that are irreducible to each other⁴.

These plastic interfaces have been precisely described:

1. at the epistemological scale where five levels have been determined: plasticity of the matter, the living, the subject, the mind and metaplasticity⁵;
2. in living systems, particularly at the scale of perception-action loops and the cognitive and mesological plasticity of plants⁶;
3. at the creative and/or art & science scale showing three steps: plasticity, plasticity of the plasticity and creativity and their metadynamics <plasticity-creativity-transversality>⁷.

humanities and engineering, A. Ertas Ed., Atlas Books, 2011.

¹ Debono, Marc-Williams. « Le concept de plasticité : un nouveau paradigme épistémologique », *DOGMA*, Revue de philosophie et de Sciences Humaines, 2007; Debono, Marc-Williams. “Le concept épistémologique de plasticité : évolution et perspectives”, *DOGMA*, Edition 15, 2021.

² Debono, Marc-Williams. “Mesological plasticity as a new model to study plant evolution, interactive ecosystems & self-organized evolutionary processes” in *Self-Organization as a New Paradigm in Evolutionary Biology: From Theory to Applied Cases in the Tree of Life*, A. Dambricourt Malassé Ed., Springer-Nature, Switzerland, Series Ed. R.G. Delisle, Vol. 5 July 2022:253–290.

³ Debono, Marc-Williams. ‘Transdisciplinarity: a new approach to metadynamics and consciousness’ in *Transdisciplinarity: Theory & Practice*, B. Nicolescu Ed., Hampton Press Cresskill, New Jersey, USA, 2008.

⁴ Debono 1996, 2005 Debono, Marc-Williams. *L'Ère des Plasticiens. De nouveaux hommes de science face à la poésie du monde*, Aubin Éditeur, 1996; Debono, Marc-Williams. “Valeur pédagogique d’une expérience transdisciplinaire de terrain”, *CIRET Bulletin* n°18, 2005.

⁵ Debono, Marc-Williams, *op. cit.*, 1996; Debono, Marc-Williams, *op. cit.*, 2008; Debono, Marc-Williams. “État des lieux de la plasticité : Partie I : les interfaces plastiques, Partie II : La plasticité de l’esprit” *Implications Philosophiques*, March 2 & May 11, 2012.

⁶ Debono, Marc-Williams. “Perceptive levels in plants: a transdisciplinary challenge in living organism’s plasticity” in *Transdisciplinary, Education, Philosophy & Applications*, B. Nicolescu & A. Ertas Editors, The Atlas Publisher, the USA, 2014; Debono, Marc-Williams. “La plasticité dans les sciences et dans les arts: What is plasticity?”, *La ChARTreusE*, June 10, 2018.

⁷ Debono, Marc-Williams. ‘From Perception to Consciousness: An epistemic vision of evolutionary processes,’ *Leonardo Journal*, Vol. 37(3): 243–248. MIT Press, USA, 2004.

We show then how the emergence of transdisciplines is the result of cross-pollination within the creative act⁸. Consequently, whether we are talking about matter and space-time or living matter, which includes synaptic plasticity and all forms of human plasticity, plasticity is the endogenous included a third of the bijective relationship that links these binomials. This is a key point in terms of transversal perception of reality and of transdisciplinary actions that can amplify the innate, non-dual plasticity between matter and mind or brain and consciousness.



Figure 4a – Theoria: The Epistemic Concept of Plasticity. This figure summarizes the four levels of interaction and the three key stages of plasticogenesis from the theoretical point of view. We return to the stages described in Figure 3, but they are clarified by precisely describing the levels of interaction and the epistemic concept of plasticity. Some ontological crossroads such as co-signification and archetypes and typical ternary processes like the Lupasco’s T state or trajectory following mesological activities. Figure slightly modified from a presentation of the author at the 3rd Mondial Congress of Transdisciplinarity (Sept. 2020, virtual mode).

⁸ Debono, Marc-Williams. “Cross-pollination in Art and Science: plasticity of the mind and birth of transcultures” in *Handbook of Transdisciplinary: Global Perspectives*, Chap 6, R. J. Lawrence Ed., Edward Elgar Publishing 2023.

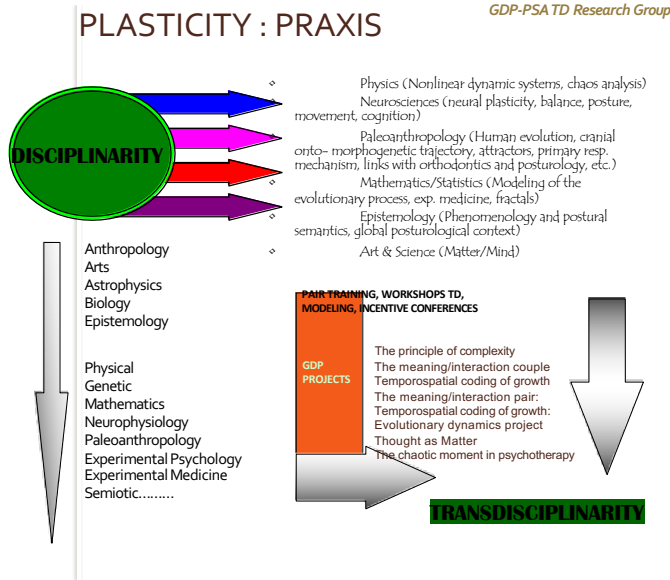


Figure 4b – Praxis: Experimental TD Groups at GDP/PSA. This table shows the implementation of experimental transdisciplinary working groups, according to the researchers’ starting disciplines and the pairs to be formed to put transdisciplinarity into practice in the field. The following figures show the setting up of TD groups by affinity. The gradual implementation of the projects will be spread over 2 to 4 years in the productive phase within the GDP and will continue in PSA and through the formation of ancillary structures for several years and up to the present day for certain projects as mentioned in the text. Data slightly modified from a presentation of the author at the Third Mondial Congress of TD (Sept 2021, virtual mode).

3. Results

Our own experience as an experimental transdisciplinary network of researchers working on the mechanisms of evolution at all scales of organization has been to set a TD course from the outset, using such transversal models not fragmenting reality. This was done within the GDP (Groupe des Plasticiens), which preceded the birth of PSA (Plasticités Sciences Arts)⁹ endorsed, in addition to Basarab Nicolescu and Edgar Morin, by Pierre Karli, Rémy Chauvin, Gilbert Durand, René Thom, Pierre Bergé and Olivier Costa de Beauregard. Various lessons were learnt about the pedagogical value of this TD experience reported in

⁹ GDP Board available here: <https://www.plasticites-sciences-arts.org/701/>, accessed on March 23, 2024. « La transdisciplinarité expérimentale », Round Table organized by the GDP, Médicis Art-Science & European Space (Palais de la découverte, Paris, June-September 1997). GDP’s Projects & Conferences available here: <https://www.plasticites-sciences-arts.org/les-projets-du-gdp/> and here: [https://www.plasticites-sciences-arts.org/les-conferences-du-groupe-des-plasticien s](https://www.plasticites-sciences-arts.org/les-conferences-du-groupe-des-plasticien-s), accessed on May 8, 2024.

the CIRET bulletin^{10,11}, its richness, and the concrete implementation of TD projects, workshops and incentive-based conferences over four years. Some involving several laboratories or doctoral works and being too ambitious, others on the contrary like the CEOPS¹² work on posture and non-linear dynamic systems by osteopaths and different medical disciplines, others having TD approaches to model theories of evolution mathematically, the plasticity of the language or studying matter and mind relations with art-science approaches (**Fig. 4 to 6**).

Main Experimental Transdisciplinary Projects of the GDP

The principle of complexity
 Basic pair: Eric Bois/Anne Dambricourt
 Keywords: contingency, parallel between cosmological and biological evolution.
 Disciplines: Mathematics/Astrophysics/Paleontology.

The meaning/interaction pair
 Basic pair: Michel de Heaulme/Medecine Doctors
 Keywords: conceptual dictionary, generic properties, linguistics.
 Disciplines: Computer Science/Medicine/Systemics/Philosophy.

Temporospatial coding of growth
 Basic pair: Roger Buis/Pierre Bergé
 Keywords: chaos, morphogenesis, growth prediction.
 Disciplines: Plant biology, Experimental physics.

Evolutionary dynamics project
 Anne Malassé, Eliane Colomb, M.W. Debono, G-E. Séralini.
 Keywords: fossil DNA, harmonic attractor, hominization, phylogenesis
 Disciplines: Molecular biology/Paleontology/Astrophysics/Modeling/Electrophysiology

Thought as material: plastic in all its forms
 Basic pair: Patricia Proust Labeyrie/M.W. debono
 Keywords: interaction, environment, cognition.
 Disciplines: Plastic Arts, Psychophysics, Ecology, Transculture.

The Chaotic Moment in psychotherapy
 Pierre Bergé, Jacqueline Dubois, Pierre Lecoy, J.F. Sallustrau, Michel Lemistre
 Keywords: chaos, family therapy, synchronicity
 Disciplines: Physics, Experimental Psychology, Neurobiology.



Figure 5: PSA-GDP Experimental TD Research Group. Here are listed the TD projects validated by the GDP (prior to the creation of PSA (Plasticités Sciences Arts) in 2000. They were carried out by researchers using different methods and resources (laboratories, external research projects, interdisciplinary groups, doctoral students, part of work in progress, modelling, projects carried out in situ, original creations, established groups seeking the TD opening offered by the GDP, individual researchers, etc.) during the 4 years mentioned above. Other projects not mentioned were born, developed and/or continued within PSA (see text and next figures for relevant and/or recent expansions of our TD activities).

These results were pursued on a discontinuous basis, depending on the commitment and free time of everyone. Nevertheless, they have created a sense of emulation and a unifying field of exploration around the concept of plasticity

¹⁰ Debono, Marc-Williams, *op. cit.*, 2005.

¹¹ « Valeur pédagogique d'une expérience transdisciplinaire de terrain », Transdisciplinary Encounters, CIRET Bull. n° 18 March 2005, available here : <http://ciret-transdisciplinarity.org/bulletin/b18c17.php>, accessed on March 23, 2024.

¹² The CEOPS was the Study Center for Osteopathy, Posturology and related Sciences (Nice, France).

that has never waned. Several of the pairs formed as part of the GDP have continued their work, either individually or collectively, through publications and/or in situ experiments. For example, the evolutionary dynamics project crossing mathematics and paleoanthropology has led to advances in this field. Art-science TD approaches like those initiated at GDP (**Fig. 6, 7**) and continued at various academic or public events¹³ are now being echoed in French and European structures such as cultural collectives producing biennials (The Science of Art, CC91¹⁴: **Fig. 8**) and the Transversal of Arts Sciences Networks or TRAS (**Fig. 9**)¹⁵, while the experimental medicine projects listed below, which had sufficiently solid foundations, continue to develop within institutional or transdisciplinary frameworks via the FREHOPS (posturology, medicine, paleoanthropology)¹⁶.

In the same way, as stated in the description of our transversal models using plasticity as vectors, several recent works and publications were done in the field of mesological plasticity of living systems with a TD methodology avoiding formalism and establishing lines of research adopting synergistic and plastic attitudes. It's the case for the study of plant intelligence where a discipline, botany, was totally refunded in the field of recent discoveries in the field of signalization and behaviors showing the ability of plants to sense, communicate, memorize, learn, elaborate defense strategy or have elaborate interspecies relations. The botanical scientific community, which is already interdisciplinary, is piling up discoveries in genetics, integrative biology, electrophysiology, functional imaging, anatomo-histology etc., but above all behavioral science, which is a great novelty in this field.

¹³ Debono, Marc-Williams. "Le concept de plasticité : une approche transversale des savoirs", Lecture given during the plenary session of the Haut Conseil de l'Éducation artistique et Culturelle (HCEAC, Paris) about "Transversality & new humanities", at the Institut national de l'histoire de l'art (INHA), Paris, December 2011; Debono, Marc-Williams. "*Transdisciplinarity in Art & Science: opening up the knowledge*", IKT Symposium, Brussels, May 2016; Debono, Marc-Williams. "Electrome & Cognition Modes in Plants: A Transdisciplinary Approach to the Eco-Sensitiveness of the World" in *Conducting Transdisciplinary Research*, Atlas Publishing, the USA, 2021.

¹⁴ Collective Culture 91/Art & Science Center available here: https://www.collectifculture91.com/pas_presentation/, accessed on May 8, 2024.

¹⁵ Transversal of Arts Sciences Networks (TRAS) available here: <https://www.reseau-tras.eu>, accessed on May 8, 2024.

¹⁶ Federation for Research into Human Evolution, Osteopathy and Posture in the Service of Health (FREHOPS) available here: <https://www.frehops.org/>, accessed on May 8, 2024.



THE GDP CONFERENCES (GROUPE DES PLASTICIENS)

Amphitheater of the Institute of Human Paleontology of Paris (1994-1998)

INTRODUCTION TO METAPLASTICITY

Marc-Williams Debono, Neurobiologist, President of the GDP



ORIGINS OF THE HUMAN SKULL: GROWTH PREDICTIONS & CONCEPT OF HARMONIC ATTRACTOR IN THE PATH OF HOMINIZATION

Anne Dambriecourt-Malassé, Paleoanthropologist IPH, CNRS

FROM COHERENCE TO CONTINGENCY

Eric Bois, Astrophysicist at the Côte d'Azur Observatory



STRUCTURE OF A GROWTH PROCESS

Roger Buis, Professor Emeritus at E.N.S.A. Toulouse



THE EVOLUTION OF MATTER, FROM THE BIRTH OF THE UNIVERSE TO DNA

Gilles-Eric Séralini, University Professor of Molecular Biology



THE USE OF NONLINEAR DYNAMIC SYSTEMS THEORY FOR THERAPEUTIC ANALYSIS IN SYSTEMIC FAMILY THERAPY

Pierre Magny-Lecoy, Jean-Claude Bouley, Jean-François Sallustrau, Group of Psychiatrists & Psychologists, "System F" Group of the Nemours Hospital Center. Michel Lemistre, Physicist at ONERA.

THOUGHT AS A MATERIAL: PLASTIC IN ALL ITS STATES

Patricia Proust-Labeyrie, Professor of Visual Arts at the University of Bordeaux II & MW Debono, Neuroscientist



RESEARCH FOR A MEANS OF DETECTING AN ORGANIZATIONAL FIELD ASSOCIATED WITH SPACE-TIME-FRACTALITY REFERENCES

Thiebault Moulin, Engineer at E.N.S.T.A., director of the SYSTEMA group

IS TRANSVERSALITY A UNIVERSAL PROPERTY OF NATURAL PROCESSES?

René Thom, Mathematician, Professor at I.H.E.S., Fields Medal



CRITICAL ASPECTS OF DARWINISM

Rémy Chauvin, zoologist, honorary professor at the Sor



WHERE DOES THE PLASTICITY OF LANGUAGE COME FROM?

Michel de Heaulme, professor of medical informatics at the Pitié Salpêtrière University Hospital

STUDY OF FASCIAE AND POSTURAL MORPHOTYPES: AN EXAMPLE OF TRANSDISCIPLINARITY

Yann Pointhière, osteopath, Pascal Cyprien, podiatrist Co-founders of the Nice Experimental Medicine Group

GENETIC AND NON-GENETIC VARIABILITY STRATEGIES

THE BRAIN OF THE HUMAN "TRINITY"

Pierre Karli, Professor Emeritus of the Louis Pasteur University of Strasbourg



APPLICATION OF NONLINEAR DYNAMICS TO THE STUDY OF THE CYTOSKELETON

Ezio Insinna, Clinical psychologist



THINKING WITHOUT LANGUAGE

Dominique Laplane, Neurologist at Salpêtrière Hospital



THE PRODUCTIONS OF MEANING, THEIR NEUROSEMANTIC ANALYSIS IN THE EXPRESSION OF NATURAL PHENOMENA AND MODES OF REASONING

Khaled Ait Hamou, Professor of Semantics

More information on the PSA Website: <http://www.plasticities-sciences-arts.org>

Figure 6: The GDP Conferences. Linked to the experimental TD groups, the GDP conferences were incentive-based in the sense that their aim was not to present a subject as is usually the case but had the clear objective of uniting the researchers present around a transdisciplinary theme in the

making. They were followed by brainstorming or thinktank and rich exchanges around the perspectives raised by the speaker and above all a common concern about the realization of the TD project and its implementation in the field. Memorable sessions took place in this dynamic like those presented by the Prof. René Thom on the transversality of natural processes, by Prof Laplane thinking without language, by the paleoanthropologist Anne Dambricourt-Malassé and the astrophysicist Eric Bois on growth predictions in human evolution or even on the use of non-linear dynamic systems by the group System F team and the physicist Michel Lemistre from ONERA.

BETWEEN ART & SCIENCE, THE CREATION



"Partie d'Arts", Exhibition of the artist Marie Claude Mignonneau on the theme "Feeling in Art & Science" (Vaux le Pénil, France 2000)



Emotion et musique



Concert Conference of the composer Frédéric Rossille, Cité Internationale des Arts (Paris, 2000)

Between Art & Science, the Creation: 5 Months of exhibition with numerous scientists at the Dosnes Thiers Foundation in Paris (JP Luminet, E Klein, J. Audouze...) & PSA's Round Tables on Experimental Transdisciplinarity at the Palais de la Découverte (Paris 1997). Org: European Space (I.A. Maréchal) and Medicis Art-Science (S. Reiss).



Left: I.A. Maréchal. Right: Patricia Proust-Labeyste & Marc-Williams Debono, presenting their GDP project: "Thinking like Matter - Plasticity in all its Forms".

Figure 7: GDP Art & Science Exploration: This figure shows various actions in the field of art and science led by the GDP or PSA, such as an exhibition about feelings in art and science near Paris (2000), a concert conference on the relationships between music and the brain led by the composer Frédéric Rossille, general secretary of PSA in 2000 and a series of GDP workshops, exhibitions and round tables presented with the European Space & Medicis Art-Science at the Palais de la Découverte in Paris (1997).



LA SCIENCE DE L'ART
du 4 novembre au 10 décembre 2017
La culture du risque
FESTIVAL ART & SCIENCE en Ile-de-France

- EDITION 2001 – CONTEMPORARY ART AT THE RISK OF CLONING
- EDITION 2006 - THE BUG
- EDITION 2009 – FROM ART : EVOLUTION
- EDITION 2011 - THE LIGHT
- EDITION 2013 - THE MOVEMENT
- EDITION 2015 – THE MEMORY
- EDITION 2017 – RISK CULTURE
- EDITION 2019 – QUESTIONNING THE INTELLIGENCE OF PLANTS
- EDITION 2021 - IMBALANCES
- EDITION 2023 - THE EXPERIENCE OF JOY

Figure 8: Different themes addressed during the biennial ‘The Science of Art’ (Paris South). Following a call for thematic projects, the CC91 (Collectif Culture 91) forms since 2000 art and

science pairs to create original works that are produced in several towns, universities, museum, media libraries and cultural centers in the Ile-de-France region. The art & science pole of the Essonne department acting through the CC91 has three missions: 1. support all scientific and transdisciplinary activities of the collective and the art-science network in Essonne and Ile-de-France (biennial, training of art-science pairs, debates, TD conferences and publications); 2. ensure a monitoring, resource and action mission in the art-science field on a territorial (Ile de France) and national/European level via the Transversal of Arts and Sciences Networks (TRAS) in France (see below one of its last TD event in Paris).

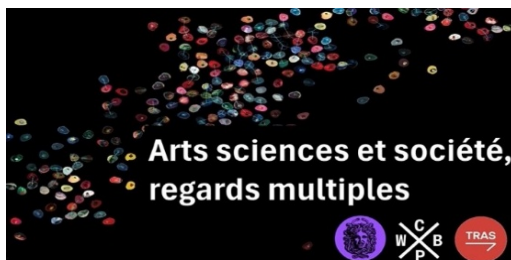


Figure 9: Arts Sciences & Society: multiple viewpoints Major initiative of our cultural structures, this area was the subject of a recent study day organized by TRAS at the Centre Wallonie Bruxelles in Paris. Many academic structures like the Diagonale or the Research-creation scene of the ENS (Ecole Normale Supérieure) of the University of Paris-Saclay are main actors of this area. From TRAS website, you can find a lot of other TD initiatives like the setting up a national survey of arts and science players supported by French ministries (see text and notes).



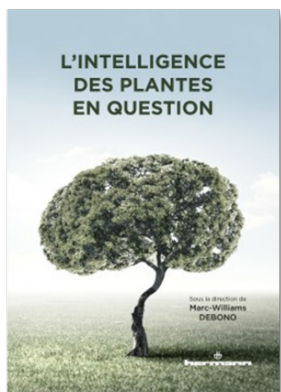
The study of plant electronic plastic interfaces¹ and the cognitive nature of plants are no longer just a hypothesis². As part of a vast scientific movement around plant signaling and behavior initiated by several academies³, it opens new avenues of work in this area, but what I want to show here is that the paradigm shift induced by this transversal model of ‘plant neurobiology’ have mobilized TD researchers from all sides including philosophers, ecologists, anthropologists, forest engineers, sociologists, but also farmers, lawyers, architects, landscapers, writers and artists.

¹ Debono, Marc Williams & Gustavo Maia Souza, *Plants as electronic plastic interfaces: A mesological approach*, Progress in Biophysics and Molecular Biology vol. 146(Suppl. 1), September 2019, p. 123-133, DOI:10.1016/j.pbiomolbio.2019.02.007.

² Debono, Marc-Williams. “*Art & Science: une intelligence sensible*”, Rencontres LASER, Cité Internationale des Arts, Paris, Septembre 23, 2021; Debono, Marc-Williams. Plasticité du vivant et exoformes in *De la science à l’art: un imaginaire extraterrestre*, ISTE OpenScience, Ltd. London, UK, 2022: 1-4.

³ Brenner, E.D, Stahlberg R., Mancuso, S. Vivanco J., Baluška F., Van Volkenburgh E., Plant neurobiology: an integrated view of plant signaling, Trends in Plant Science, Vol. 11, 8: 413- 419, 2006.

This vast field of study includes controversies and discussions of a semantic nature, but above all unparalleled emulation and many interdisciplinary discoveries about the communication capacities of plants. PhDs on plant philosophy and a lot of TD works around eco-sensitivity have also seen the light of day in this context.



Caught in this current through my earlier scientific discoveries on the plant electrome and as an actor in the art-science field, I was involved very closely, hence the publication of my latest general public book: '*L'intelligence des plantes en question*'⁴ which gives voice to scientists like Jacques Tassin or Luciano Boi, philosophers like Emanuele Coccia, Claudia Zatta or Michael Marder and artists like Yann Toma or Anaïs Lelièvre. A transdisciplinary publication perfectly illustrating how a transversal model based on the plasticity of life can bring together a heterogeneous panel of researchers who would never have crossed paths or questioned each other without this

common vision and the ramifications that it generates at all levels

4. Discussion

Have a perspective in which the interactivity of code systems can be expressed⁵ is fundamental, as suggested at Arràbida⁶. This calls for the adoption of transdisciplinary plastic attitudes constantly linking monodisciplinary architectures and their generic and/or ontological contents. The methodology I propose is to cross these disciplinary fields, taking the trouble to identify the *ontological crossroads* or areas of overlap that characterize them. The emergence of a common meaning will be the experimental proof of the effectiveness of the face-to-face relationship between human plasticity and the adoption of a transdisciplinary, transcultural attitude. These are typically transversal models, capable of transcending duality and discipline boundaries, specifically in higher education⁷, because they articulate contradictory pairs by projecting them across disciplines that philosophers, artists and scientists (from hard sciences and humanities) will be able to explore in radically different ways. Otherness as the driving force of evolution, as is demonstrated in the living world by plants and biodiversity.

All these initiatives form an integral part of the transdisciplinary body we

⁴ Debono, Marc-Williams. *L'intelligence des plantes en question*, Hermann, Paris, 2020.

⁵ Marc-Williams Debono, « The plastic code of life » Proc. of the 1st Mondial Congress of Transdisciplinarity, (Hugin Ed. Lisbon, Portugal, 1999).

⁶ Debono, Marc-Williams. 'The Plastic Code of Life' in *Transdisciplinarity*, Acts of the 1st Int. Congress of transdisciplinarity, Hugin Ed., 1999.

⁷ Leslie Schwartzman, « Transcending Disciplinary Boundaries: A Proposed Theoretical Foundation for Threshold Concepts », in *Threshold Concepts and Transformational Learning* (Sense Publishers, Boston, Rotterdam, Taipei: Jan H.F. Meyer, Ray Land, Caroline Baillie Eds. 2010) 21–44.

plan to develop within this new international TD Chair, and open avenues of research in this perspective. What we can learn from these experiences and compare them with the TD approaches of everyone – whatever the discipline – is that, despite the obstacles and hindrances specific to institutions and cultures – particularly Western ones – the TD dynamic is alive and well! Now more than ever, it is expressing itself in cross-cutting fields such as humanist ecology, the commons, the return of the sensitive, the consequences of the Anthropocene, artistic and cultural education, ecoanxiety, transpersonal psychology, AIs and the research-creation process, against a backdrop of ongoing defragmentation of knowledge and know-how.⁸ With this in mind, we must highlight the presence of the recent creation in France of several art-science-society TD masters and PhD programs at university (PSL⁹, Paris Saclay¹⁰) and of an Art & Science chair (Polytechnique School-EnsAD and Carasso Foundation)¹¹. Moreover, numerous territorial cultural centers like the CC91¹² near Paris (**Fig. 9**) are supported by the roll-out of French and European structures like the TRAS (**Fig. 10**) which has done surveys carried out upon players in this cross-disciplinary field that are supported by the French ministries of research, culture, national education and ecological transition. This is a clear indication of the awareness and transdisciplinary work accomplished through the cross-pollination of the art-science field¹³.

One of the objectives of our Chair could be to initiate or pursue the transformation of these essays – palpable products of a TD experience expressed through a common work – into other cross-disciplinary fields. It's a question of working together on the transdisciplinary body in all its forms, taking advantage of the mutation of human cultures¹⁴ and the TD issues at stake in each of our

⁸ Transdisciplinarity and the evolution of knowledge: foundations and practices. Acfas congress with the contribution of Florent Pasquier, available here: <https://www.acfas.ca/evenements/congres/programme/90/600/658/c>, accessed on May, 3, 2024.

⁹ PhD SACRE: <https://psl.eu/en/news/sacre-phd-program-invites-candidates-invent-their-own-research-methods>.

¹⁰ Université Paris Saclay available here: <https://www.universite-paris-saclay.fr/en/education/master/culture-patrimoine-et-mediation/m1-evenementiel-mediation-des-arts-et-des-sciences>, accessed on May 3, 2024.

¹¹ Chaire Art & Science (Ecole Polytechnique, EnSAD, Fondation Carasso, available here: <https://chaire-arts-sciences.org/?lang=en>, accessed on April 20, 2022.

¹² Collective Culture 91. Art & Science Center available here: https://www.collectifculture91.com/pas_presentation/, accessed on May 3, 2023.

¹³ Marc-Williams Debono, « Cross-pollination in Art and Science: plasticity of the mind and birth of transcultures » in *Transdisciplinary: global perspectives*, Handbook of Transdisciplinary: Global Perspectives edited by Roderick J. Lawrence (Edward Elgar Publishing 2023).

¹⁴ Mariana Thieriot Loisel, *Les Mutations Humaines*, Preface by M.-W. Debono (Amalthée Ed. 2016); Thieriot Loisel Mariana, Debono Marc-Williams, PLoisel Patrick, Ghils Paul et D'Ambrosio. Ubiràtan, *Recherche scientifique, plasticité et transdisciplinarité: une chaire transdisciplinaire possible dans les universités* in *La communauté de pratiques comme outil de dialogue interreligieux et interculturel*, COP UNESCO, S. Guetta & A. Verdiani Ed., FUP/ Firenze University Press (Italy), Chap. 6.2 :115–119, 2011; Thieriot Loisel Mariana and Debono Marc-Williams. “Pathologie des énergies et plasticité du soi” in Tome IV of the *Acts of the 3rd Mondial Congress*

praxis. What's important is the sharing of knowledge and the adoption of a common language, even a common imaginary, that doesn't fall into the trap of epistemological cages so well described by the Ubiràtan d'Ambrosio! Ethics and dialogical philosophical foundations of human consciousness¹⁵ to be applied before they are translated into sometimes irremediable acts...

5. Conclusion

The TD initiatives that we have been able to carry out in the past within the framework of TD actions or world congresses of which CIRET is a spearhead and at the same time in our TR research network at PSA is today rewarded by the deployment of TD worldwide. We briefly show here the role that our contribution may have had on the plasticity of living systems and the epistemology of the concept of plasticity, both in the form and the working methodology of the GDP, as well as in the substance (subjects of study and field actions undertaken by the actors of the different fields of TD research) that we explored. Our great satisfaction, shared with the members of CIRET who regularly contribute to our work and publications, is to note, as we have shown with different examples, that not only are these ramifications alive today, but that they are developing in sectors affecting both the hard sciences and the humanities, without forgetting the key role of contemporary art in the development of otherness and a porosity essential to the depth of the expression of a lived transdisciplinarity.

The lessons to be learned from this transdisciplinary experience as part of our symposium objective to launch an international TD Chair are that the TD dynamic instilled upstream has therefore spread and borne fruit. We are therefore ready to promote the educational, ethical and transdisciplinary values of our corpus without disassociating knowledge from people's experiences. I invite consequently all the organizations, research groups, associations and TD researchers who are the linchpins of the transdisciplinary body that we all form together, to set up an ontological crossroads that would encourage the emergence of human plasticity and would overcome disciplinary taboos. But it is also at the level of everyone that this web takes shape, a need to unlearn, a keen awareness of one's relationship to others and to the world.

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The author declares that he has no conflicts of interest with respect to the research, authorship, and/or publication of this article. Any errors or omissions are his own.

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¹⁵ Marc-Williams Debono, « Transdisciplinarity: a new approach to metadynamics and consciousness » in *Transdisciplinarity: Theory & Practice*, B. Nicolescu Ed. (Hampton Press Cresskill, New Jersey, USA, 2008).

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