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Building Transdisciplinary Urban Space (Part I): Theoretical Transurbanism

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This paper is the first part of a set of three papers that utilizes the classification of transdisciplinarity into theoretical, phenomenological and experimental transdisciplinarity (Nicolescu 2010) to suggest some fundamental perspectives and concepts that would be required in order to start building a transdisciplinary vision for urban space in research. The work is divided into three papers. In this paper we deal with **Theoretical transdisciplinarity** *in urbanism, which needs to take into account the dialectical process of scaling and the interrelationship among various spatial scales; it also needs to come to terms with the idea of relationality of urban space, a humanistic view of space and place, the "poetics of space," and a clear understanding of the idea of space in contemporary physics theories such as quantum gravity, together with an understanding of visual thinking. In the second paper we deal with* **Phenomenological transdisciplinarity** *as applied to urbanism, or the experience of the built space, which needs to transcend both intellectualism and empiricism via Merleau Ponty's and Lefebvre's triad of spatial practices, representational space and spaces of representation, differential space, and Soja's thirdspace; it also makes use of the architectural concepts of schemata, diagram and type; further, phenomenological transurbanism uses the concept of palimpsest in order to account for the experience of time in space. The third paper deals with Experimental transdisciplinarity, which in urbanism takes into account basic quantum concepts such as non-locality, entanglement, discontinuity, non-separability, and aims at explaining processes of planetary urbanization in the so-called "Anthropocene," characterized by glocalization, hybridization, complexity, sustainability, remembrance and the reality of digital spaces.*

Keywords*:* Transurban space, relational space, quantum gravity space, spatial perception, spatial experience, spatial consciousness, scaling, poetics of space.

1 Introduction

"There is a*theoretical transdisciplinarity, a phenomenological transdisciplinarity*, and an experimental transdisciplinarity. The word theory implies a general definition of transdisciplinarity and a well-defined methodology (which has to be distinguished from "methods"; a single methodology corresponds to a great number of different methods). The word phenomenology implies building models that connect the theoretical principles with the already observed experimental data in order to predict further results. The word experimental implies performing experiments following a well-defined procedure, allowing any researcher to get the same results when performing the same experiments" [1].

We use Nicolescu's above classification of transdisciplinarity to analyze transdisciplinary urban space from a theoretical, phenomenological and experimental perspective. In this paper we focus on the theoretical perspective, which we investigate by pivoting on the nature, properties, perception, experience and consciousness of transurban space. Regarding the nature of transurban space, we describe relational space in Lefebvre and Harvey, and summarize the conception of space in loop quantum gravity theory. Concerning the properties of transurban space, we focus on scales and networks as components of a space of flows. The perception of transurban space is framed by visual thinking, visual-spatial intelligence and designerly ways of thinking. Lastly, we focus on the work of Yi-Fu Tuan to explain the experience of space and place, and discuss some elements in the work of Gaston Bachelard to suggest that space is the dwelling of consciousness, as a prelude to tackle the phenomenology of transurban space in the next paper.

2 Nature of Theoretical Transurban Space

2.1 Relational Urban Space

The notion of relational urban space springs most explicitly from the French philosopher Henri Lefebvre's thinking, according to which space should not be conceived of as a static and empty continuum to be filled with people, objects and actions but as something that is constantly (re)produced in human activities and interactions [2]. This view resonates with Michel de Certeaus idea of how the city is written from down below by the stories that the intersecting wonderings of ordinary urban dwellers compose. In the networks that are formed by these incessant 'bodily writings', the city itself 'remains daily and indefinitely other' thereby escaping the attempts to impose upon it an imaginary totalisation 'from above'. In the background we have of course de Certeaus well-known distinction between the strategies of the powerful and the tactics of the weak that provides either a point of departure or a more indirect source of inspiration for some of this special issue's authors [3].

Lefebvre proposed "social space" to be where the relations of production are reproduced and that dialectical contradictions were spatial rather than temporal. Lefèbvre sees the societal production of space as a dialectical interaction between three factors. Space is constituted:

- by "spatial practice," meaning space as reproduced in everyday life
- by the "representation of space", meaning space as developed cognitively
- and by "spaces of representation," by which Lefebvre means complex symbolisations and ideational spaces.

In Lefebvre's view of the 1970s, this spatial production resulted in a space of non-reflexive everydayness marked by alienation, "dominating through mathematical-abstract concepts of space, and reproduced in spatial practice. Lefebvre sees a line of flight from alienated spatiality in the spaces of representation – in notions of non-alienated, mythical, pre-modern, or artistic visions of space" [4].

David Harvey also proposes a tripartite conceptualization of space, but his is based on the absolute, relative and relational conception of space:

> If we regard space as absolute, it becomes a "thing in itself" with an existence independent of matter. It then possesses a structure that we can use to pigeonhole or individuate phenomena. This view of relative space proposes that space be understood as a relationship between objects that exists only because objects exist and relate to each other. There is another sense in which space can be viewed as relative,

> and I choose to call this relational space – space regarded in the manner of Leibniz, as being contained in objects in the sense that an object can be said to exist only insofar as it contains and represents within itself relationships to other objects [5].

Harvey argues that, in a dialectic conception, "space is neither absolute, [nor] relative [n]or relational in itself, but it can become one or all simultaneously depending on the circumstances" and on human practice [6].

Thus, he continues on to note that

> the problem of the proper conceptualization of space is resolved through human practice with respect to it. In other words, there are no philosophical answers to philosophical questions that arise over the nature of space – the answers lie in human practice [7].

The conceptualization proposed by Harvey can easily be harmonized with that of Lefebvre. Harvey proposes to do exactly that:

> I propose, therefore, a speculative leap in which we place the threefold division of absolute, relative and relational space-time up against the tripartite division of experienced, conceptualized and lived space identified by Lefebvre. The result is a three-by-three matrix within which points of intersection suggest different modalities of understanding the meanings of space (and time) [8].

In addition, Harvey proposes to articulate this conceptual matrix using the Marxist concepts of use value, exchange value and value, generating a new analytical matrix.

> From this perspective, the author stresses that "everything that pertains to use value lies in the province of absolute space and time", whereas "everything that pertains to exchange value lies in relative space-time because exchange entails movement of commodities, money, capital, labor and people over time and space." Finally, because value is a relational concept, "its referent is [...], relational space-time", underlining that "value, as Marx states, is immaterial, but objective." [9].

Here it is relevant to readdress the question of the definition of public space. Taking the approach of Harvey and Lefebvre as a reference, we could say that

> public space is neither absolute nor relative, nor is it relational in itself, but instead is characterized by dimensions related to those three dimensions in permanent dialectic tension. Inspired by an example given by Harvey himself, in which he attempts to understand a house situated in a certain space, one can look at a square and recognize the three dimensions. A square has a physical and legal materiality and is related to the absolute space [10].

This approach shows how different public spaces are experienced and appropriated as spaces of experience and perception associated with the quotidian (spaces experienced by persons, who uses different spaces, and how those different spaces are used); how they are represented as spaces (spaces conceptualized in different ways, as open or closed, distant or near, spaces of business or leisure, etc.); and how they are representational spaces (space experienced – i.e., the sensations, imagination, memories, emotions and meanings associated with public space). Therefore, public spaces are experienced as much materially as they are intellectually and emotionally.

What is interesting to retain from this discussion is that human practice is producing, appropriating and assigning new meanings to urban common spaces. Moreover, as Lefebvre affirms,

> [...] as for the class struggle, its role in the production of space is a cardinal one in that this production is performed solely by classes, fractions of classes and groups representing classes. Today more than ever, the class struggle is inscribed in space [11].

2.2 Space in Loop Quantum Gravity

According to Carlo Rovelli [12], whom we follow in this section, one of the main proponents of Loop Quantum Gravity (LQG), confusion about the nature of space – even more so for time–originates

from failing to recognize that these are stratified, multi-layered concepts. They are charged with a multiplicity of attributes and there is no agreement on a terminology to designate spatial notions lacking same of these attributes. When we say space we indicate different things in different contexts. The only route to clarify the role of space in quantum gravity is to ask what we mean in general when we say 'space'. There are distinct answers to this question; each defines a different notion of 'space'. Let's disentangle them.

Relational space: 'Space' is the relation we use when we locate things. We talk about space when we ask "Where is Andorra?" and answer "Between Spain and France". Location is established in relation to something else (Andorra is located by Spain and France). Used in this sense 'space' is a relation between things. It does not require metric connotations. It is the notion of space Aristoteles refers to in his Physics, Descartes founds on 'contiguity', and so on. In mathematics it is studied by topology. This is a very general notion of space, equally present in ancient, Cartesian, Newtonian, and relativistic physics.

This notion of space is equally present in LQG. In LQG, in fact, we can say that something is in a certain location with respect to something else. A particle can be at the same location as a certain quantum of gravity. We can also say that two quanta are *adjacent*. The network of adjacency of the elementary quanta of the gravitational field is captured by the graph of a *spin network*. The links of the graph are the elementary adjacency relations. Spin networks describe relative spacial arrangements of dynamical entities: the elementary quanta.

Newtonian space: In the XVII century, in the *Principia*, Newton introduced a distinction between two notions of space. The first, which he called the "common" one, is the one illustrated in the previous item. The second, which he called the "true" one, is what has been later called Newtonian space. Newtonian space is not a relation between objects: it is assumed by Newton to exist also in the absence of objects. It is an entity with no dynamics, with a metric structure: that of a 3d Euclidean manifold. It is postulated by Newton on the basis of suggestions from ancient Democritean physics, and is essential for his theoretical construction. Special relativity modifies this ontology only marginally, merging Newtonian space and time into Minkowskis spacetime. In quantum gravity, Minkowski spacetime and hence Newtonian space *appear only as approximations*. They have no role at all in the foundation of the theory.

General relativistic space: Our understanding of the actual physical nature of Newtonian space (and Minkowski spacetime) underwent a radical sharpening with the discovery of General Relativity (GR). The empirical success of GR–slowly cumulated for a century and recently booming–adds much credibility to the effectiveness of this step. What GR shows is that Newtonian space is indeed an entity as Newton postulated, but is not non-dynamical as Newton assumed. It is a *dynamical* entity, very much akin to the electromagnetic field: a gravitational field. Therefore in GR there are two distinct spacial notions. The first is the simple fact that dynamical entities (all entities in the theory are dynamical) are localized with respect to one another ("This black hole is inside this globular cluster"). The second is a left-over habit from Newtonian logic: the habit of calling 'space' (or spacetime) one particular dynamical entity: the gravitational field. There is nothing wrong in doing so, provided that the substantial difference between these three notions of space (order of localization, Newtonian non-dynamical space, gravitational field) is clear.

LQG treats space (in this sense) precisely as GR does: a dynamical entity that behaves as Newtonian space in a certain approximation. However, in LQG this dynamical entity has the usual additional properties of *quantum* entities. These are three: (i) Granularity. The quantum electromagnetic field has granular properties: photons. For the same reason, the quantum gravitational field has granular properties: the elementary quanta represented by the nodes of a spin network. Photon states form a basis in the Hilbert state of quantum electromag- netism like spin network states form a basis in the Hilbert space of LQG. (ii) Indeterminism. The dynamics of the quanta of space (like that of photons) is probabilistic. (iii) Relationalism. Quantum gravity inherits all features of quantum mechanics incuding the weirdest. Quantum theory (in its most common interpretation) describes interactions among systems where properties become actual. So happens in LQG to the gravitational field: the theory describes how it interacts with other systems (and with itself) and how its properties become actual in interactions [13].

'Space' (and 'Time') are expressions that can mean many different things:

1. Space can refer to the ***relative localization*** of things, time can refer to the ***becoming*** that shapes Nature. As such, they are present in LQG like in any other physical theory.

2. Spacetime is a name given to the ***gravitational field*** in classical GR. In LQG there is a gravitational field, but it is not a continuous metric mani- fold. It is a quantum field with the usual quantum properties of discreteness, indeterminism and quantum relationality.

3. Space and time can refer to preferred variables used to locate things or to track change, in particular ***reading of meters and clocks***. In LQG, rods and clocks and their (quantum) behaviour can in principle be described, but play no role in the foundation of the theory. The equations of the theory do not have preferred spacial or temporal variables.

4. Thermal, causal, **"flowing"** aspects of temporality are ground on chapters of science distinct from the elementary quantum mechanics of reality. They may involve thermal time, perspectival phenomena, statistics, brain structures, or else.

5. The universe described by quantum gravity is not flowing along a single time variable, nor organised into a smooth Einsteinian geometry. It is a network of quantum processes, related to one another, each of which obeys probabilistic laws that the theory captures. ***The net of quantum interactions between systems is identified with the net of adjacent spacetime regions***.

3 Properties of Theoretical Transurban Space

3.1 Scales and Levels of Spatiality

Given that urbanism is a domain of social action where research ought to be conducted around object-subject interactions, I follow Nicolescu's assertion that "My line of thinking is in perfect agreement with that of Heisenberg." For me, "beyond disciplines" precisely signifies the Subject, and, more precisely, the Subject-Object interaction. The transcendence inherent in transdisciplinarity is the transcendence of the Subject. The Subject cannot be captured in a disciplinary camp" [14]. Heisenberg classifies the numerous regions of reality in only three levels, in terms of the different proximity between the Object and the Subject. He deduces that the rigid distinction between exact and human sciences has to be abandoned, a fact which sounds very, very transdisciplinary.

Heisenberg's first level of reality corresponds to fields that embody objectivity in an independent way from the knowledge process. Classical physics, electromagnetism, and the two theories of relativity of Einstein belong in this level. The second level corresponds to fields inseparable from the knowledge process: quantum mechanics, biology, and the sciences of consciousness (like psychoanalysis), for example.

Finally, the third level corresponds to fields created in connection with the knowledge process. He situates there philosophy, art, politics, the metaphors concerning God, the religious experience, and the artistic creative experience. If the first two levels of Heisenberg totally correspond to my own definition, the third one mixes lev- els and non-levels (in other words, the zones of non-resistance) [15].

Heisenberg insists on the crucial role of intuition: "Only an intuitive thinking," writes Heisenberg, "could bridge the abyss between old and new concepts; the formal deduction is impotent in realizing this bridge [...]" [16]. But Heisenberg did not draw the logical conclusion concerning this impotence of formal thinking; only the non-resistance to our experiences, representations, descriptions, images, or mathematical formalisms can bridge the abyss between two levels. This non-resistance restores the continuity broken by levels.

Knowledge of the coexistence of the quantum world and the macrophysical world and the development of quantum physics have led,

> on the level of theory and scientific experiment, to pairs of mutually exclusive contradictories (A and non-A): wave and corpuscle, continuity and discontinuity, separability and non-separability, **local causality and global causality**, symmetry and breaking of symmetry, reversibility and irreversibility of time, and so forth. The intellectual scandal provoked by quantum mechanics precisely consists in the fact that the pairs of contradictories that it generates are actually mutually exclusive when they

> are analyzed through the interpretive filter of classical logic. However, the solution is relatively simple: one has to abandon the third axiom of the classical logic, imposing the exclusion of the third, the included middle T. [17].

3.2 Scaling the Global in Global Cities

Early approaches to the global city implicitly or explicitly adhered to a strong globalization thesis; namely, the unmediated and unilinear impact of global forces over particular territories worldwide. The global city became as much a process as a place, and similarities between global cities were highlighted to the detriment of their specificities and differences. Many studies treated social and spatial polarization as a universal consequence of globalization and as a prominent feature of all global cities. Few scholars considered the multiplicity of interacting and changing spatial scales of globalization, and most worked under the assumption that globalization processes intertwined two clearly delineated conceptual categories – the "local" and the "global." This framing not only posited the global as active and powerful and the local as passive and weak, it also omitted possible co-variations with places larger than the city (or the city-region) yet smaller than the global level.

This schematic characterization of local against global has been overcome by integrating multiple spatial scales (local, regional, national) in the analysis. The new assumption is that regional and national states play a significant role in the reconfiguration of local processes, not only because they react to processes occurring at the global level but because they mobilize resources to actively link cities and nations with the global economy. The problem with the earlier local-global duality was that it confined cities to a politically irrelevant role in the face of globalization and reified spatial scales as self-contained units.

3.3 Networks and Global Cities

One approach to world cities focuses on the transnational networks in which cities are embedded, and then analyzes the composition and character of these networks in a global context. This is quite compatible with the growing interest in the changing locations and economic roles that cities play in regional, national or international hierarchies of urban places. It is also used to study historically cities embedded in colonial and imperial networks. With this approach, as much attention is paid to the transnational network itself as to the institutions or practices linking particular cities and mediating the development of the network.

A second, equally popular approach shares a concern with global networks, but focuses on territorially-bounded locations in these global networks. To use Manuel Castells terminology, the concern is as much the 'spaces of places' as the 'spaces of flows' [18]. Scholars who employ this perspective would argue that the globalization of capital and labor fuels the growth and economic successes of some cities (i.e. New York) while constraining others (i.e. Detroit), thereby exacerbating regional economic polarization.

A third approach is the "regional approach," but understood in transnational as much as intra-national terms. This is a conceptual departure from the past when the notion of region referred to a spatial territory within a single nation-state. Scholars of Europe (and slightly less so East Asia) now study the urban effects of globally-integrated (transnational) regionalism, perhaps because their home nations are caught up in these dynamics. Their concern is how globalization increases transnational economic integration so as to form mega-regions with their own supranational governing institutions; whether locales on the receiving end of global investments and labor flows assume greater political and economic significance; and the conditions under which globally-integrated cities will by-pass the nation-state and negotiate directly with each other in larger regional pacts.

These lines of research have implications for understanding the dynamics of cities as well as the global context in which they operate, if only because they underscore the ways that, in an increasingly globalized world, the nation-state or other subnational or supranational jurisdictions is challenged or remains the most politically relevant unit for mediating among cities, addressing intra-national regional disparities, and/or coordinating new practices and institutions. Instead of having to choose between the local and the global view, the network approach posits a global entity that is continuously local, even as it builds on relational thinking.

4 Perception of Theoretical Transurban Space

Perception (from the Latin *perceptio*) is the organization, identification, and interpretation of sensory information in order to represent and understand the presented information, or the environment. All perception involves signals that go through the nervous system, which in turn result from physical or chemical stimulation of the sensory system.

4.1 Visual Thinking

According to Rudolph Arnheim, whom we follow in this section, visual structuring occurs in two ways which he calls the intuitive and the intellectual mode. The "intuitive" mode of cognition is available only through perception. The process of structuring, in which each element receives its character by taking its place in the whole, occurs to some extent below the level of consciousness. Thinking is impossible without recourse to perceptual images [19].

> In our own time, language has been designated as the place of refuge from the problems incurred in direct perceptual experience; this in spite of the fact that language, although a powerful help to our thinking, does not offer in and by itself an arena in which thinking can take place. In order to arrive at knowledge the human mind must go "beyond the information given" by direct sensory experience. There is the belief that the cognitive development of a child passes through three stages. The child explores the world first through action, then through imagery, and finally through language. The implication is, unfortunately, that with the arrival at a next level the earlier one falls by the wayside. Thus when the child learns to go beyond a particular constellation directly given to his eyes, the ability to restructure the situation in a more suitable way is not credited to the maturing of perceptual capacity but to the switch toward a new processing medium, namely, language. Thus language is praised as the indispensable instrument for essential refinements of the mind of which in fact language is little more than a reflector [20].

Since experts insist that perception offers nothing better than the fairly mechanical recording of the stimuli arriving at the sensory receptors, it is useful to respond that perception transcends constantly and routinely the mere mechanical recording of sensory raw material.

> This led to attempts to clean the individual case of whatever was not pertinent to it. In addition to perfecting the practical performance of the animal, this method had two advantages. It induced a positive scrutiny of the modifying factors, which in the statistical procedure simply dropped out as so much "noise." In addition, however, the method reduced the scientific practice to "simple looking." Whereas the statistics divert the psychologist's attention from the actually observed cases to the manipulation of purely numerical data, that is, to the refuge "beyond the information given," the cleaned-up individual case makes a type of behavior directly perceivable. It displays for the observant eye the interaction of the relevant factors [21].

4.2 Visual-Spatial Intelligence

Visual Spatial Intelligence is defined by Gardner (in 'Frames of Mind') as the ability to perceive the visual world accurately, to perform transformations and modifications upon ones initial perceptions, and to be able to re-create aspects of ones visual experience, even in the absence of relevant physical stimuli [22].

The following skills represent the core abilities of individuals with Visual-Spatial Intelligence:

- Spatial Awareness - The ability to solve problems involving spatial orientations and moving objects through space, such as finding ones way around, or manoeuvring a car.
- Working with objects - The ability to use strategic eye-hand co-ordination to construct, arrange, decorate or fix things.
- Artistic Design - The ability to carry out tasks or projects, which require aestheticism, judgement and design.

4.2.1 Designerly Thinking

In the design area, we find five different discourses of 'designerly thinking', or ways to describe what

designers do in practice, that have distinctly different epistemological roots. These different discourses do not stand in competition with each other but could be developed in parallel.

Theoretical perspectives can be categorized into five sub-discourses, identified as having clear roots and a substantial academic following, with the foundational work(s) within parentheses. This section 4 follows the discussion by Johansson-Skldberg et al (2013) in Creativity and Innovation Management [23]:

1. Design and designerly thinking as the *creation of artefacts* (Simon, 1969).
2. Design and designerly thinking as a *reflexive practice* (Sch" on, 1984).
3. Design and designerly thinking as a *problem - solving activity* (Buchanan, 1992).
4. Design and designerly thinking as a *way of reasoning/making sense of things* (Lawson, 2005[1980]; Cross, 2006, 2011).
5. Design and designerly thinking as *creation of meaning* (Krippendorff, 2006).

4.2.2 Making Sense of Things

Lawson and Cross, who both trained as architects, each described and reflected on practical cases of designers thinking and working.

> Their interests spanned many years: Lawson's book, How Designers Think: The Design Process Demystified, has had four revisions since 1980, and Cross's research included design thinking workshops at Delft University of Technology in 1991, continued with a series of articles on 'designerly ways of knowing' and, recently, his book Design Thinking (2011). Cross works from ethnographic research to reveal what designers do during the activity of designing, while Lawson draws on the psychology of creative design processes to turn his research knowledge into forms designers can use [24].

4.2.3 Creation of Meaning

Starting from a philosophical and semantic background, Krippendorff defined design and designers' work as a matter of creating meaning (rather than artefacts as in Simon's notion). Compared with Simon, one could say that Krippendorff reversed the relation between the design object and its intention. For Simon the artefact is at the core, and he would probably say that meaning is an attribute, while for Krippendorff meaning is the core of the design process and the artefact becomes a medium for communicating these meanings.

> Krippendorff is concerned with the textual and intertextual matter of discourse, 'the artefacts it constructs and leaves behind ... (and) the connections created between these artefacts'. Design thinking concerns him only as articulated by designers, that is, when it creates a text that becomes part of the discourse of the design community. 'The primary aim of a discourse is to stay viable ... to be kept alive within a community of its practitioners ... [and] to justify its identity to outsiders' [25].

Verganti (2009) extended Krippendorff's work to innovation processes, arguing that innovation in meaning is as important as technological innovations that are mostly related to the concept of innovation.

> One of his examples is Alessi's commercially successful kitchenware that gives radical new meanings to commonplace objects like a corkscrew and a lemon squeezer. Before they were designed, the company had an extensive collaboration with a psychologist, and the way the objects look – as stylized products rather than mundane tools – was based on frame theories of boundary objects to which individuals were especially attached. Nintendo's Wii is another example of a product that could not have been conceived by video game players before its appearance in the market, yet the console was a radical innovation in meaning, from an entertainment gadget for children to active physical entertainment, in the real world, through socialization. In other innovation research, winemakers have deliberately altered meanings for new wines, and design students have radically changed meanings of gender conveyed through chairs or objects to sit on [26].

4.2.4 Critical Design

The term Critical Design was first used in Anthony Dunnes book Hertzian Tales (1999) and further developed in *Design Noir: The Secret Life of Electronic Objects* (2001). Its opposite is affirmative design: design that reinforces the status quo. It is more of an attitude than a style or movement; a position rather than a method.

> There are many people doing this kind of work who have never heard of the term critical design and would describe their work differently. Naming it Critical Design is simply a way of making this activity more visible and emphasising that design has other possibilities beyond solving problems. Critical Design is discussed as an approach in Design Research, as a way to critique social, cultural, technical and economic controversies through designing critical artefacts. According to Sanders Critical Design involves also probes as "ambiguous stimuli that designers send to people who then respond to them, providing insights for the design process." Uta Brandes identifies Critical Design as discrete Design Research method and integrates it in human-centered design activities as a useful tool for stakeholders to critically think about possible futures [27].

4.2.5 Critical Play

The concept of critical play has also come into vogue in recent years. Researcher Mary Flanagan wrote *Critical Play: Radical Game Design* in 2009, the same year that Lindsay Grace started the Critical Gameplay project.

> Grace's Critical Gameplay project is an internationally exhibited collection of video games that apply Critical Design. The games provoke questions about the way games are designed and played. The Critical Gameplay Game, Wait, was awarded the Games for Change hall of fame award for being one of the 5 most important games for social impact since 2003. The work has been shown at Electronic Language International Festival, Games, Learning & Society Conference, Conference on Human Factors in Computing Systems among other notable events [28].

As critical design has gained mainstream exposure, the discipline has been itself criticized by some for dramatizing so called 'dystopian scenarios,' which may in fact be reflective of real-life conditions in some places in the world.

> Some see Critical Design as rooted in the fears of a wealthy, urban, western population and failing to engage with existing social problems. As an example, a project titled Republic of Salivation, by designers Michael Burton and Michiko Nitta, featured as part of MoMA's Design and Violence series, portrays a society plagued by overpopulation and food scarcity which is reliant on heavily modified, government-provided, nutrient blocks. Certain media responses to the work, point to the "presumed naivety of the project," which presents a scenario that "might be dystopian to some, but in some other parts of the world it has been the reality for decades" [29].

5 Experience of Theoretical Transurban Space

The experience of space is lived space. I am using here Alex Mahoudeau's review of Yi-Fu Tuan's piece "Space and Place." If the positivist critique has brought some insight and methods to geography, its pretention to analyse only the spatial spatially only was in part in contradiction with itself, because of its refusal to think "the spatial" in relation with other elements of the world, leading to highly abstract analyses. If the critical answer to this approach has been widely acknowledged, its humanistic counterpart must not be neglected, as it provides a different, and no less interesting, answer to the aporias of "abstract space" analyses. This humanistic critique has been represented in the best way by Yi-Fu Tuan in his earlier works. "Humanistic," as a notion, must not here be taken as the historical form of "humanism" and the set of ethics and principles it has promoted. In Tuan's words, the term designates before all a scientific position, which focuses on the strictly human dimension of endeavours

and, therefore, on the symbolic dimension of human behaviour:

> All animals express themselves, and chimpanzees can be taught to paint, yet literature and the arts are specifically human endeavors. Science itself is a unique manifestation of human capacity, and hence the nature of science is of vital interest to humanists. Doing philosophy is perhaps the human activity par excellence for its basic character is reflection. The habit of philosophical reflection is rare among nonhuman creatures. People not only dance, speak, and think, as other animals may also do, but they are able to reflect on their acts and to evaluate them critically. From the scientific perspective many themes in sociology and in human geography-whether male-bonding, territoriality, or architecture-are almost reducible to those of animal ethology. The humanistic perspective focuses on activities and their products that are distinctive to the human species [30].

The 1979 article "Space and Place: Humanistic Perspective" follows this earlier presentation to elaborate on the two central concepts of geography which are seen, as the author states in introduction, as defining the nature of geography.

> The humanistic approach, in Tuan's approach, is not in strict opposition to some elements of the positivist school. The author does not reject a priori the positivist ambition of apprehending space abstractly, but gives it a different meaning. While the positivist school posits an objectively existing abstract space, Tuan considers abstraction as a result of a process of cognition and as a regular way of knowing space: "The study of space, from the humanistic perspective, is thus the study of a peoples spatial feelings and ideas in the stream of experience. (...) The geographer's understanding of space is abstract, though less so than that of a pure mathematician. The spatial apprehension of the man in the street is abstract, though less so than that of a scientific geographer" [31].

5.1 Space

Space, argues Tuan, is not a single thing but can rather be approached as a multiplicity of mental constructions which all rely on the interaction between the human body and its environment. For his discussion of what space is and how to approach it, Tuan explores several themes:

5.1.1 Space and the Body

Tuan assumes the comprehension of space as a category of perception (Tuan discusses the relation between space and time on that matter, but it is not the core argument; let us simply remind that the author shows how linguistically the notions are not opposed but entangled), and proposes to push that conception to its limit by insisting of the fact that space perception is primarily a bodily function and, therefore, is bounded by the biology of human beings. This approach, he shows, allows an explanation of why the positivist school, which took geometrical and abstract space for granted, was failing at defining it properly. For Tuan there is a difference between geometrical space, which is a result of a cultural process of production, and original space:

> We can say little more than that original space possesses structure and orientation by virtue of the presence of the human body. Body implicates space; space coexists with the sentient body. This primitive relationship holds when the body is largely a system of anonymous functions, before it can serve as an instrument of conscious choice and intentions (...) Visual perception, touch, movement, and thought combine to give us our characteristic sense of space. Bifocal vision and dexterous hands equip us physically to perceive reality as a world of objects rather than as kaleidoscopic patterns. (...) The recognition of objects implies the recognition of intervals and distance relation among objects, and hence of space [32].

In other words, space as a category of perception comes from the fact that humans are bodies which deal with stuff, but the enunciation of space as relations (primarily, of distance) is already the effect of a symbolic interpretation: there is no description of space available to humans which would be capable

of accessing it as an "objective" dimension, space is always the result of a process of thinking and representation. This does not mean for the author to marginalise his biological discussion: the cultural production of space is differing, but similar, because of some biological determination.

> This is not, in Tuan, the result of an uprooted generalisation, but of accounting of the research, including in human ethology and psychology, being led as he writes his article: finding his sources in anthropology and the first constructed cognitivist studies, the author argues for a "common core" approach. For instance, if the author supports the structuralist claim that power is associated with verticality, he insists that this is due to a biological determination ("Human beings are more sensitive to vertical and horizontal lines than to oblique lines, more responsive to right angles and regular shapes than to acute or obtuse angles and irregular shapes. (...) The bilateral organisation of the human body and the direction of gravity have been suggested as the causes of such bias"). Yet the biological does not suffice to apprehend space because "only among human beings do these natural biases acquire symbolical meaning" [33].

5.1.2 Space and the Individual

Here again the author takes an approach in terms of genealogy, and returns to his previous assertion that spatial experience is at first bodily, and then constructed upon: "Unlike the segmentation of time, nature itself doesn't seem to provide suitable units for the measurement of either distance or area," thus explaining that most units of identification in space or of space are derived either from the body or the common objects.

> The linguistic argument made Tuan on that point serves a different argument entirely, which is to show how much space corresponds to a centre of experience and, therefore, influences most ways of thinking or perceiving the world, from the most basic images ("A far-sighted person is not necessarily someone with good eyesight."), but also in activity (for instance Tuan shows how we influence our way of thinking about things such as intellectual work spatially, as a journey with a beginning, an end, and a linear progression, while no actual operation takes place in space, or how manufacturing is conceived as a "road"). These representations appear to be associated with specific shapes: work is associated with directed space (organised around a displacement and a system of directions) while recreational or sacred endeavours appears more associated with non-directed space (a temple is often conceived as an isotropy, and a place of leisure as a place of staying) [34].

While this discussion can appear as very abstract, it does have essential elements for geography as the approach which does not take into account the experience of space necessarily misses that the representations it produces (mostly maps) are partial descriptions of what goes on in space for the individual persons who are concerned by it:

> We are used to seeing the one map as a cartographic device [in this case, the description of a tanker full of oil out of the Middle East to Europe] summarising certain economic facts, and the other as a means for representing events in human geography [the representation of the movement of people from the Eastern shore of the USA to the centre]. But the humanist geographer can read between the lines. (...) Instead of a mere short walk from here (now) to there (then), the journey of a tanker over thousand of miles of water, taking several weeks around the Cape of Good Hope, acquires a little of the drama of an odyssey. (...) The arrow represents his lived-space, which is also his lived-time [35].

5.1.3 Space and the Group

Beyond the personal experience of space, the author adds another layer to his model, which includes the fact that humans generally interact with one another in space, defining group experiential space, "I mean the spatial experience that is defined by the presence of other people."

> Once again the author insists on the importance of the relation between activity, meaning, and sense of space. He takes the example of crowdedness, the feeling that "there are too many people." Crowdedness is, argues Tuan, a singular human phenomenon ("A boulder field is a solitary place however it might be packed with boulders"). It is not, either, a phenomenon which can be objectively measured ("Two may be a crowd if both are poets of nature. On the other hand, a baseball stadium packed with 30,000 people is certainly crowded in a numerical sense, but it doesnt follow that the spectators feel the spatial constraint"). The use the persons make of space and their relation to it define the sense of crowdedness [36].

5.1.4 Mythical Spaces

Mythical (or mythical-conceptual) space is neither linked to the high abstraction of positivist space, nor to the expertiential spaces described by the author earlier. It "occupies a position between the space of sense perception and the space of pure cognition." It is the imaginary or symbolic dimension of space. This is the space studied by the anthropologists, which makes sense of a certain apprehension of the world, associates the ways of identifying and naming directions, of dividing the world in a – generally – anthropocentric manner (regardless of the fact that societies may be or not be anthropocentric).

5.2 Place

The first critique of space is followed by a critique of the notion of place in geography. The notion, argues Tuan, does not strictly mean location, but goes beyond that. In the English language as in several others, place both carries a sense of location and social position. The author's question is at first, which one is the "main" meaning.

> The author's first thesis is that the social somehow precedes the spatial: "Spatial location derives from position in society rather than vice-versa. The infant's place is the crib; the childs place is the playroom; the social distance between the chairman of the board and myself is as evident in the places we sit at the banquet as in the places we domicile; the Jones live on the wrong side of the tracks because of their low socio-economic position", and so forth. Yet there is something specifically geographic to consider about place, it does not behave like the mere index of society which would allow pinpointing different social categories, as we will se with the author's discussion of the several meanings of the word. The author also denies to bind the notion of place to any specific scale: a place is whatever location makes social and geographical sense. Place is not defined by a scale, a size, or a shape. It can be a chair, a crib, a region, or the earth itself, depending on the situation [37].

5.2.1 Meaning

The school of regional geography encompassed the notion of region as an area with a specific "taste." This is not very far from the signification of place meaning.

> A place has a "spirit," one would say, which makes it unique. Places can be attached to specific impressions or attempt to inspire awe or affection. This is due to the fact that objects are symbolically charged. A raincoat, the example taken by the author, is just any raincoat until it becomes "this particular raincoat that I wear," the same phenomenon occurs with place. This investment of meaning and personality in place derives from the human ability to have a sense of place: People demonstrate their sense of place when they apply their moral and aesthetic discernment to sites and locations. (...) However, other than the all-important eye, the world is known through the senses of hearing, small, taste, and touch. These senses, unlike the visual, require close contact and long association with the environment [38].

In other words, sense of place comes from habit and practice. It is the phenomenon which conducts a street to become from "one street", "ones street." It is associated to a form of knowledge and memory of place, as much as symbolic projection.

6 Consciousness of Theoretical Transurban Space: The Poetics of Space

Consciousness is the state or quality of awareness, or, of being aware of an external object or something within oneself. It has been defined variously in terms of sentience, awareness, qualia, subjectivity, the ability to experience or to feel, wakefulness, having a sense of selfhood or soul, the fact that there is something "that it is like" to "have" or "be" it, and the executive control system of the mind. In contemporary philosophy its definition is often hinted at via the logical possibility of its absence, the philosophical zombie, which is defined as a being whose behavior and function are identical to one's own yet there is "no-one in there" experiencing it. In our context, consciousness of theoretical transurban space entails the notion that space is the abode of consciousness: it is a poetics of space. Let us see what this means by following Joan Ockman's discussion in Harvard Design Magazine (see note 39).

Three or four decades ago a book entitled The Poetics of Space could hardly fail to stir the architectural imagination. First published in French in 1957 and translated into English in 1964, Gaston Bachelards philosophical meditation on oneiric space appeared at a moment when phenomenology and the pursuit of symbolic and archetypal meanings in architecture seemed to open fertile ground within the desiccated culture of late modernism. "We are far removed from any reference to simple geometrical forms," Bachelard wrote in a chapter entitled "House and Universe." "A house that has been experienced is not an inert box. Inhabited space transcends geometrical space." In lyrical chapters on the "topography of our intimate being"–of nests, drawers, shells, corners, miniatures, forests, and above all the house, with its vertical polarity of cellar and attic–he undertook a systematic study, or "topoanalysis," of the "space we love" [39].

> Although Bachelard was specifically concerned with the psychodynamics of the literary image, architects saw in his excavation of the spatial imaginary a counter to both technoscientific positivism and abstract formalism, as well as an alternative to the schematicism of the other emerging intellectual tendency of the day, structuralism. In his book Existence, Space and Architecture (1971), Christian Norberg-Schulz, the most prolific and long-term proponent of a phenomenological architecture, asserted that "further research on architectural space is dependent upon a better understanding of existential space," citing Bachelard's Poetics of Space together with Otto Friedrich Bollnows Mensch und Raum (1963), the chapter on space in Maurice Merleau-Pontys The Phenomenology of Perception (1962; original French, 1945), and two key works by Martin Heidegger, Being and Time (1962; German, 1927) and the essay "Building Dwelling Thinking" (1971; German, 1954), as fundamental texts [40].

In his own time, Bachelard (1884–1962) was a remarkable intellectual figure, reputedly a reader of six books a day, and author of twenty-three at the time of his death, not counting his scores of essays, prefaces, and posthumous fragments. He produced eight more volumes dealing with the epistemology of knowledge in various sciences, becoming increasingly preoccupied with the dangers of a priori thinking and questions of objectivity and experimental evidence.

> In L'Expérience de l'espace dans la physique contemporaine (1937), confronting the philosophical implications of Einsteins monumental breakthrough in physics and Heisenberg's uncertainty principle, Bachelard took up the contradictions between Descartess and Newton's concepts of physical space as empirical, locational, and stable, and the abstract, counterexperiential constructs of space-time being theorized by 20th-century microphysics [41].

But Bachelard's inquiry into the revolutionary character of the new scientific mind little prepared his colleagues for the unconventional turn his work was to take at the end of the 1930s. Influenced by psychoanalysis and surrealism, two books, *The Psychoanalysis of Fire* (1938) and *Lautréamont* (1939), signaled a shift in his focus from physical science to the phenomena of consciousness, from "the axis of objectivization" to "that of subjectivity." With *The Psychoanalysis of Fire*–a book in which Bachelard set out to "question everything," "to escape from the rigidity of mental habits formed by contact with

familiar experiences" – he initiated a series of investigations into the psychic meanings of the four cosmic elements, conceived as constituting the repertory of poetic reverie, the "material imagination."

> The project of discerning a loi des quatre lments would preoccupy him until his death, resulting in a suite of remarkable volumes on fire, earth, air, and water. In *Lautréamont*, another excursion into the domain of depth psychology–more Jungian than Freudian, as noted by Deleuze and Guattari, admirers of the book –Bachelard set out to study the phenomenology of aggression in the wild, "animalizing" imagery of the 19th-century Uruguayan poet Isidore Ducasse, author of *Les Chants de Maldoror,* one of the sacred texts of the surrealists (and later of the Cobra group, on whom Bachelard was to be deeply influential) [42].

As Bachelard acknowledged in *The Psychoanalysis of Fire*, "The axes of poetry and of science are opposed to one another from the outset. All that philosophy can hope to accomplish is to make poetry and science complementary, to unite them as two well-defined opposites." Yet what profoundly links Bachelard's philosophy of knowledge to his poetics of the imagination, his scientific epistemology to his study of psychic phenomena, is his concern with how creative thought comes into being.

> Like Michel Foucault after him (and anticipating Thomas Kuhn's notion of the paradigm shift), Bachelard directed epistemological inquiry away from the continuities within systems of knowledge toward the obstacles and events that interrupt the continuum, thereby forcing new ideas to appear and altering the course of thought. Bachelard's concept of the epistemological obstacle–a concept Foucault would assimilate in The *Archaeology of Knowledge*–was an attempt to demonstrate how knowledge incorporates its own history of errors and divagations [43].

The "epistemological profile" of any scientific idea included the multiple obstacles that had to be negated or transcended dialectically–and thus absorbed–in the process of arriving at more rational levels of knowledge. Countering the codification of universal systems of thought and the formation of collective mentalities, as Foucault would put it, were events and thresholds that suspended the linear advancement of knowledge, forcing thought into discontinuous rhythms and transforming or displacing concepts along novel avenues of inquiry.

> For Bachelard as for Foucault, such epistemological obstacles played a crucial and creative function in the history of thought. Scientific inquiry therefore had to remain nonteleological and open to the possibility of such reorderings and reversals. In this way, modern rationalism would be a transcendent rationalism, "surrationalism." "If one doesn't put one's reason at stake in an experiment," writes Bachelard in "Le Surrationalisme" (1936), "the experiment is not worth attempting" [44].

For Bachelard, the role played by the epistemological obstacle in experimental science is exactly paralleled by that of the poetic image in literary language. In Bachelard's view, the authentically poetic image emerges from a form of forgetting or not-knowing that "is not ignorance but a difficult transcendence of knowledge." As such, it "constantly surpasses its origins." Hence, neither history nor psychology can ever fully determine or explain it.

> As he puts it in *The Poetics of Space* – underscoring the irony in the title of his earlier book on fire – the problem with psychoanalysis (just as with Marxist interpretations of history) is that it seeks to explain the flower by the fertilizer. For Bachelard, the poetic image "has no past; it is not under the sway of some inner drive, nor is it a measure of the pressures the poet sustains in the course of his early life... . The trait proper to the image is suddenness and brevity: it springs up in language like the sudden springing forth of language itself." Bachelards notion of the role played by chance and mutability in the emergence of the poetic image is virtually identical to the creative principle of the surrealists. For Bachelard, surrealism is related to realism as surrationalism is to rationalism [45].

Explicit in his ontology of the poetic image, as in surrealist literature and art, is a critique of the ocular

privilege accorded by Enlightenment philosophy to geometry and visual evidence. Despite its perceptual sophistication, the eye cannot necessarily go beyond a description of surface: "Sight says too many things at the same time. Being does not see itself. Perhaps it listens to itself." Space, for Bachelard, is not primarily a container of three-dimensional objects. For this reason the phenomenology of dwelling has little to do with an analysis of "architecture" or design as such: "it is not a question of describing houses, or enumerating their picturesque features and analyzing for which reasons they are comfortable" [46]. Rather, **space is the abode, the shelter of human consciousness**, and home is just "a place in the world," as Hannah Arendt put it.

It is no coincidence that Bachelard first evokes this atavistic dream world – "a house that comes forth from the earth, that lives rooted in its black earth" – in his book *La Terre et les râveries du repos,* published in 1948, just after the Second World War [47]. Bachelards recourse to the poetics of "felicitous space" would seem to be a way of countering an encroaching modernity. His antipathy to 20th-century urbanism and technology receives its strongest expression in *The Poetics of Space*:

> In Paris there are no houses, and the inhabitants of the big city live in superimposed boxes... . They have no roots and, what is quite unthinkable for a dweller of houses, skyscrapers have no cellars. From the street to the roof, the rooms pile up one on top of the other, while the tent of a horizonless sky encloses the entire city. But the height of city buildings is a purely *exterior* one. Elevators do away with the heroism of stair climbing so that there is no longer any virtue in living up near the sky. *Home* has become mere horizontality. The different rooms that compose living quarters jammed into one floor all lack one of the fundamental principles for distinguishing and classifying the values of intimacy. But in addition to the intimate nature of verticality, a house in a big city lacks cosmicity. For here, where houses are no longer set in natural surroundings, the relationship between house and space becomes an artificial one. Everything about it is mechanical and, on every side, intimate living flees [48].

Bachelard's evocation of the rustic abode in Champagne is almost exactly contemporary with Heidegger's paean to the peasant hut in the Black Forest.

Henri Lefebvre, who admired both philosophers, was among the first to point out the shared aura of nostalgia that suffuses their poetics of dwelling. The "special, still sacred, quasi-religious and in fact almost absolute space" that both Bachelard and Heidegger associate with the idea of house reflects "the terrible urban reality that the twentieth century has instituted." The reverie of a maternal, womblike, and stable home, sheltering and remote, is, as Anthony Vidler has suggested more recently, a symptomatic response to the experience of an *unheimlich modernity* [49].

From this perspective, the work of Foucault begins–consciously–where Bachelard leaves off. Instead of Bachelards timeless reverie of felicitous space, Foucault prefers to confront the "coefficient of adversity" in the phenomenology of human habitation, addressing questions of historicity and power in relation to spatial discourse and institutions. The Poetics of Space thus leads, at least by one route, to Foucault's seminal essay of 1967 on heterotopia, in which Foucault suggestively proposes to shift the problematic of Bachelardian topoanalysis from intimate space to "other spaces"–spaces of crisis, deviance, exclusion, and illusion; in other words, to heterotopoanalysis [50].

7 Concluding Remarks

Our exploration of theoretical transurbanism pivoted on the nature, properties, perception, experience and consciousness of transurban space. We used Nicolescu's classification of transdisciplinarity to analyze transdisciplinary urban space from a theoretical, phenomenological and experimental perspective. In this paper we focused on the theoretical perspective. Regarding the nature of transurban space, we described relational space in Lefebvre and Harvey, and summarized the conception of space in loop quantum gravity theory. Concerning the properties of transurban space, we focus on scales and networks as components of a space of flows. The perception of transurban space is framed by visual thinking, visual-spatial intelligence and designerly ways of thinking. Lastly, we focus on the work of Yi-Fu Tuan to explain the experience of space and place, and discuss some elements in the work of Gaston Bachelard to

suggest that space is the dwelling of consciousness, as a prelude to tackle the phenomenology of transurban space in the next paper.

Theoretical transurban space is a multi-layered concept that can be approached from multiple angles. The researcher needs to take into account the contributions of several disciplines to the idea of space and make sure that the resulting conception does not show major contradictions among the various disciplinary viewpoints. For example, any conception of transurbanspace coming from the social sciences needs to be consistent with the ideas about space developed by the physical science, as we tried to show by discussing the concept of space in loop quantum gravity, which ought to lead social scientists to update their relational conception of space, taken from Leibniz and consistent with relativity theory.

It is important to remember that transurbanism combines knowledge and design, discovery and creativity, and therefore both understanding and perception play a role in the configuration of its field of endeavor and its methodologies. In this paper, we briefly reviewed the classical contributions to the "intelligence of the senses" of Arnheim (on visual thinking), Gardner (on visual-spatial intelligence) and designerly thinking in order to highlight the fact that intelectual reasoning alone cannot offer an appropriate description of theoretical transurban space.

The multidimensionality of theoretical transurban space indicates that space, as Tuan argues, is not a single thing but can rather be approached as a multiplicity of mental constructions which all rely on the interaction between the human body and its environment. This perspective of individual experience is spatial consciousness, and consciousness is what is inhabited by space, because space is the abode of consciousness. With Bachelard we enter the realm of the poetics of space, which constitutes a prelude to the phenomenology of transurban space, a topic to be explored in the next paper.

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