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The *Science of Urbs* and Its Discontents: A Proposal for Reconceptualizing Urbanism

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Abstract: This paper suggests a mode of inquiry for urbanism based on transdisciplinarity. Our contention is that if massive geohistorical developments pose a fundamental challenge to the entire field of urban studies (its basic epistemological assumptions, categories of analysis, and object of investigation), as posited by some researchers, then a satisfactory way of meeting such challenge cannot come from within urban studies or any other discipline, but rather from a transdisciplinary perspective "beyond and between disciplines," one that rejects scientific realism and uses its own, distinct epistemological axioms to flesh out the interactions between object and subject (knowledge and design, discovery and creation) in research as the preliminary foundation for a new conception of urbanism. This paper works as a draft where the focus is on collecting and organizing evidence as a first step in our project for a proposal for transdisciplinary urbanism.
Keywords: Transdisciplinarity, urban space, phenomenology, urban studies, capitalist urbanization, sociospatial transformations.

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Planetary Urbanization

"Planetary urbanization" is an expression originating in the work of Henri Lefebvre (1968, 1970, 1989) that has recently been used to mark an attempt at reconceptualizing the field of urban studies from its foundations. In a brief article in *Urban Constellations* (2011), Neil Brenner and Christian Schmid, main proponents of the planetary urbanization approach, argue that twentieth-century urban studies rested on the assumption that cities ("conurbations," "city-regions," "urban regions," "metropolitan regions," and "global city-regions") "represented a particular *type* of territory that was qualitatively specific, and thus different from the "non-urban" spaces that lay beyond their boundaries." According to Brenner & Schmid, during the last thirty years, the form of urbanization has been radically reconfigured, a process that "has seriously called into question the inherited cartographies that have long underpinned urban theory and research" (2011, 10-11).

Among the recent far-reaching worldwide socio-spatial transformations there are (Brenner & Schmid, 2011, 13-14, *passim*):

- *"The creation of new scales of urbanization*. Extensively urbanized interdependencies are being consolidated within extremely large, rapidly expanding, polynucleated metropolitan regions around the world to create sprawling urban galaxies that stretch beyond any single metropolitan region and often traverse multiple national boundaries" (Brenner & Schmid, 2011, 13).

- *"The blurring and rearticulation of urban territories*. Increasingly, former "central functions," such as shopping facilities, company headquarters, research institutions, prestigious cultural venues, as well as spectacular architectural forms, dense settlement patterns, and infrastructural arrangements, are being dispersed outwards from historic central city cores, into erstwhile suburbanized spaces, among expansive catchments of small- and medium-sized towns, and along major transportation corridors such as superhighways and rail lines" (Brenner & Schmid, 2011, 13).

- *"The disintegration of the "hinterland."* Around the world, the erstwhile "hinterlands" of major cities, metropolitan regions and urban-industrial corridors are being reconfigured as they are functionalized — whether as back office and warehousing locations, global sweatshops, agro-industrial land-use systems, recreational zones, energy generation grids, resource extraction areas, fuel depots, waste disposal areas, or corridors of connectivity — to facilitate the continued expansion of industrial urbanization and its associated planetary urban networks" (Brenner & Schmid, 2011, 14).

- *"The end of the wilderness.* In every region of the globe, erstwhile wilderness spaces are being transformed and degraded through the cumulative socio-ecological consequences of unfettered worldwide urbanization. In this way, the world's oceans, alpine regions, the equatorial rainforests, major deserts, the arctic and polar zones, and even the earth's atmosphere itself, are increasingly interconnected with the rhythms of planetary urbanization at every geographical scale, from the local to the global" (Brenner & Schmid, 2011, 14).

According to Brenner & Schmid, these geohistorical developments pose a fundamental challenge to the entire field of urban studies. Its basic epistemological assumptions, categories of analysis, and object of investigation require a foundational reconceptualization

"in order to remain relevant to the massive transformations of worldwide socio-spatial organization we are witnessing today, which point toward the urban as representing an increasingly worldwide condition in which political-economic relations are enmeshed. This situation of *planetary urbanization* means, paradoxically, that even spaces that lie well beyond the traditional city cores and suburban peripheries — from transoceanic shipping lanes,

transcontinental highway and railway networks, and worldwide communications infrastructures to alpine and coastal tourist enclaves, nature parks, offshore financial centers, agro-industrial catchment zones and erstwhile natural spaces such as the world's oceans, deserts, jungles, mountain ranges, tundra, and atmosphere — have become integral parts of the worldwide urban fabric." (Brenner & Schmid, 2011, 14).

Paralleling their critique of the traditional concept of "city," Brenner & Schmid question the validity of the "urban age" idea. In a 2014 IJURR article (*The 'urban age' in question*), Brenner & Schmid argue that,

"despite its long history and its increasingly widespread influence, the urban age thesis is a flawed basis on which to conceptualize world urbanization patterns: "it is empirically untenable (a statistical artifact) and theoretically incoherent (a chaotic conception)." This critique "is framed against the background of postwar attempts to measure the world's urban population, whose main methodological and theoretical conundrums remain fundamentally unresolved in early 21st century urban age discourse" (Brenner & Schmid, 2014, 14).

Brenner's experimental project promotes a new concept of urbanity and "it is more than natural that the next step should consist in submitting an alternative cognitive map that would supersede all the deficiencies and misrepresentations propagated by the discourse of the urban age" (Brenner & Schmid, 2014, 16).

The need for a new vocabulary in urban studies is clearly stated in *Implosions/Explosions. Towards a Study of Planetary Urbanization* (2013), where Brenner et al build upon "the methodological foundations of the scalar turn, embedding the urban within a fluidly extending landscape," and continue the critical assessment of place-based approaches to the urban question. In the book, Brenner and Schmid assert that "the inherited analytical vocabularies and cartographic methods do not adequately capture the changing nature of urbanization processes" and therefore emergent patterns "require the development of new analytical approaches ... including experimental and speculative ones ... new visualizations ... a new lexicon of urbanization processes and forms of territorial differentiation" (Brenner & Schmid, 2013, 334).

"Urban studies must abandon a whole array of outdated categories and concepts whose popularity in the techno-political sphere, as well as in cultural studies, is detrimental." The authors demand "the removal of categories describing circumscribed locations, such as the "city", "polis", "megapolis", "edgy city", "divided city", and "town" along with the typical distinctions between "urban" and "rural" – as in the classic survey of English literature, *The Country and the City* by Raymond Williams – "centre" and "periphery", "centre" and "suburb." The same applies to the often investigated "boundaries", for example between the "haves" and "have-nots", as in Loren Kruger's *Imagining the Edgy City: Writing, Performing, and*

Building Johannesburg. In sum, the authors enjoin us "to replace the discrete with the continuous, the stagnant, *locum*-oriented with the process-oriented and dynamic approaches" (Brenner & Schmid, 2013, 334).

Criticism

Richard Walker (2015) contends that Brenner & Schmid have failed to advance the cause of urban studies very far in their essay, 'Towards a new epistemology of the urban?' through a combination of over-attention to first principles in social theory, reiteration of familiar themes in urban research, and neglect of important historical and geo-graphical knowledge about cities. According to Walker, The general flaws of the piece are these (Walker, 2015, *passim*):

- "It is more of a manifesto than a theoretical statement about cities and urbanization, and it spends too much time with propositions at the level of metaphysics/philosophy. It functions more as ground clearing than a real debate about urbanism" (Walker, 2015, 26).

- "The authors engage too much in setting up and knocking down straw men. Yes, of course, a lot of popular discourse about the 'new urban age' is naive in how it talks about cities and measures urbanization of the globe, but that is to be expected. But what urban theorist really thinks that we are 'witnessing the world-wide proliferation of a singular form of "the" city'?" (Walker, 2015, 26).

- "In positioning themselves in relation to recent developments in post-colonial urban theory, the authors go in exactly the wrong direction. They accept the 'epistemological opening' created by the critique of existing urban theory as Eurocentric but proceed to reject urban theory from the Global South for 'its tendency to treat "the city" as a privileged terrain for urban research'." (Walker, 2015, 26).

- "To the extent the authors are correct about the contemporary failings of urban studies, little of what they have to say about the new planetary urban condition is terribly new, except in degree. Their arguments could use a stiffer dose of urban historiography." (Walker, 2015, 26).

- "Furthermore, even as our authors spend a disproportionate amount of time on philosophical tenets, they still manage to reiterate a number of common errors in their approach to social science. They still need to be more materialist in their ontology, more dialectical in their conceptualizations, and more hard-boiled about social scientific method." (Walker, 2015, 26).

Ananya Roy (2015) focuses her critique on a point made by Brenner and Schmid about the relationship between the rural and the urban: "There is, in short, no longer any *outside* to the

urban world; the non-urban has been largely internalized within an uneven yet planetary process of urbanization" (Brenner & Schmid, 2013, 256). They continue, "the urban/rural binarism is an increasingly obfuscatory basis for deciphering the morphologies, contours and dynamics of sociospatial restruc- turing under early twenty-first century capitalism" (Brenner & Schmid, 2013, 260).

Roy argues that the rural is much more than the nonurban, that it is in fact a "constitutive outside" (Roy, 2015, 45). It is not the only or even the privileged constitutive outside but it is a vitally important one.

"This means that even if we are to concede the urbanization of everything, everywhere, we have to analytically and empirically explain the processes through which the urban is made, lived, and contested—as a circuit of capital accumulation, as a governmental category, as a historical conjuncture. What is at stake in different deconstructions of the urban—which is how I see this piece of critical urban theory—is what Brenner and Schmid describe as the morphologies, contours and dynamics of sociospatial restructuring under early twenty-first century capitalism" (Roy, 2015, 47).

For Roy, today's urban question is a land question, but this land question very much encompasses

"regulations, registers, and rights that are not urban and that are not simply making way for the urban. The social relations of production as well as the political identities and struggles evident in such territories cannot be encompassed by the urban. The processes of becoming urban, of making urban, are both old and incomplete. It is incomplete because, at least in the case of the Kolkata metropolitan region and its surrounding municipalities, the urban land question cannot be fully resolved because of how it is entangled with what were once and still are rural land regimes. The rural, this rural, is not the antonym of urban. It is not not-urban. Needless to say, the rural, like the urban, is not a morphological description but rather an inscription of specific regulations. The urban question, as a project of critical theory, has always been concerned with historical alternatives. We need to read the urban from the standpoint of absence, absence not as negation or even antonym but as the undecidable" (Roy, 2015, 49).

Natalie Oswin (2016) takes issue with the attempt to consolidate ''*a* new epistemology of the urban'' and argues for the importance of epistemic plurality within urban studies. She writes against

"a radical approach to urbanization that focuses predominantly on capitalist exploitation and class dynamics, and for a radical approach to urbanization inspired by Marxist insights as well as insights gleaned from other critical approaches such as queer, feminist, postcolonial and critical race theories. While Brenner and Schmid seek to fix attention on their provocative claim that there is no longer any *outside* to the urban world, their work highlights

and perpetuates the existence of the many outsides within critical urban theory" (Oswin, 2016, 62).

Sue Ruddick (2015) argues that it is precisely the level of generalization contained in the framings of planetary urbanism that contributes to the sense of paralysis, regardless of post hoc qualifications that this planetary form is internally hierarchized and differentiated.

"For political economists, the attentiveness of assemblage theorists risks a frustrating agnosticism where "a passive-voice politics prevails in which assemblages are anonymously, almost mysteriously destabilized or dismantled" (Brenner, Madden, & Wachsmuth, 2011, p. 236). Against a framing which is deemed too "broad" or "indeterminate to realize its proper potential," Brenner calls for a precise circumscription of the normative parameters of assemblage approaches, with renewed attention to the ways that contradictory and crisis tendencies play out in contemporary processes of urbanization.

But Brenner's strategy has its limits. How to affect a rapprochement (beyond the openness to eclecticism proffered as a kind of peace offering on both sides of the debate) that at the same time enables us to think the relation between the urban and the Anthropocene with greater conceptual clarity? Rather than attempting to weld an urban political economy to an urban assemblage approach (with all the attendant if unspoken and as yet unresolved tensions that union would surface between genealogy and dialectics, between total and general history, between contra- diction and differentiation as its motor force), it might be more productive to return to the site of the confusion surrounding the urban, this very rupture between discourse and form, to make visible the truth of the assemblage, the specificity that Brenner calls for.

Thought in relation to the urban, Ruddick contends, the anthropological machine offers a meeting ground between urban political economy and assemblage urbanism. It enables us to situate the Anthropocene and differentiate the urban. But it also exposes a deep divide between scholars reframing the human beyond "Western man": between those for whom the more-than-human expresses the dreams of a biophilic city and those for whom the less-than-human is increasingly its living nightmare" (Ruddick, 2015, 112-13).

Sue Ruddick et al (2017) argue that, "while Neil Brenner and Christian Schmid have successfully marked some important limits of mainstream thinking on the urban, their privileging of epistemology cannot produce an urban theory for our time." Engaging in a symptomatic reading of their work, and with a focus on the implications of their limited mobilization of social ontology—or Lefebvre's ontology of the everyday—they ask "what is occluded in planetary urbanization.

In particular, they explore "three areas of concern: the urban as the grounds for difference, centrality and the everyday; the omission of subjects of and occlusion of subjectivity; and the occlusion of a constitutive outside and its political capacities to remake the urban" (Ruddick et al, 2017, 53).

The authors point out that

"urbanization is an open process determined through praxis, by actual people making the world they inhabit. Brenner and Schmid's focus on epistemology as the site of a generative reimagining of the urban—at the expense of social ontology—limits the possibilities of planetary urbanization as the means through which we can produce an urban theory for our time. By destabilizing the imputed stasis of the urban, they have saved the concept from the hands of formalists and urban agers. But the 'planetarity' of urbanization can only ever be a speculative epistemological enterprise, one of many competing analytical frameworks. Planetary urbanization is not the only, perhaps not even the most crucial, mode from which we can conceive the emancipatory politics of a right to the city, a politics which foregrounds autogestion and mondialization. If there is to be an urban theory for our time it must not only engage but emerge from difference. It is not merely that we are asking that difference be acknowledged as a constitutive aspect of capitalism, but that we must recognize difference, struggles over social ontology and the everyday as the seedbed of struggle, the locus from which subjects are capable of transforming both themselves and the world in which they live" (Ruddick et al, 2017, 62).

A New Way Forward for Urbanism

We remain persuaded that it is extremely problematic for the researcher to blur the demarcation between urban and non-urban, as Brenner and Schmid seem to prescribe for a situation of planetary urbanizaton. In science, and in the philosophy of science, the concept of "demarcation" is essential, even from a pragmatic perspective (Resnik 2000): "it allows to identify which scientific practices produce theories that can be epistemologically validated." If one wants to point out the limitation of the concept of "city" for empirical research, it is certainly not helpful to propose instead the study of a situation of complete or planetary urbanization with no alternatives in empirical reality. We would say that the field of study proposed by Brenner and Schmid has no defined object: it is all reality and, therefore, no reality. It is necessary to establish distinctions between the urban and that which is not urban, or establish levels of urbanity. Because of this, Brenner´s and Schmid´s vision for urbanism under "planetary urbanization" defeats itself as a heuristic strategy.

Further, the "rural" is, as Ananya Roy has suggested, constitutive of the urban. This means that we "must explain the processes by which planetary urbanization is constituted. The processes of urban formation are necessarily incomplete. We must read the urban from the viewpoint of absence – absence not as negation or antonym, but as that which is undecidible" (Roy, 2015, 53). I shall argue below that rather tan proposing just "undecidability" we ought to think also in terms of "incompleteness" in a Gödelian sense, "uncertainty" in a Heisenbergian sense and "indetermination." This opens the way for new logical axioms in a transdisciplinary approach to urbanism.

In sum, Brenner´s and Schmid´s effort to rigorously refound the field of urban studies is welcome and deserves credit, but it exhausts itself and perishs if we take it to to its logical conclusion, due to the lack of demarcation criteria. This lack would cause, paradoxically, the

dissolution of the research field these authors are attempting to refound. The paradigm of planetary urbanization would then become an updated version of empirical research around the political economy of global capitalism broadly understood. In Brenner and Schmid, the urban disappears from the equation due to the absence of the non-urban. It is appropriate to recognize planetary urbanization as a global empirical development of our times, as the authors do, but once we have done so we must define and limit our object of study and, for this endeavor, we probably ought to keep using the old spatial concepts associated to "the city" in its various manifestations. The key is not to replace "the city" with "the urban," but rather to use both in dialectical and complementary ways.

Based on the shortcomings outlined above, in what follows I will flesh out a few specific proposals for the rearticulation of urban studies under conditions of planetary urbanization. It is my contention that the complex ontology of urbanism requires a transdisciplinary approach to research, one with its own epistemological presuppositions, which go beyond the intellectualism and empiricism of scientific realism and problematize in rigorous ways the fundamental interactions between the immanence of the object and the "being-in-the-worldness" of the subject, as applied to the conception of urban space. Only the planned bracketing out of this integration of the subject into the object allows for "scientific realism," but just as a heuristic strategy rather than an epistemology.

The Transdisciplinary Construction of Urban Reality

Since Berger and Luckmann (1966) we know that reality is socially constructed. People and groups interacting in a social system create, over time, concepts or mental representations of each other's actions, and that these concepts eventually become habituated into reciprocal roles played by the actors in relation to each other. When these roles are made available to other members of society to enter into and play out, the reciprocal interactions are said to be institutionalized. In the process, meaning is embedded in society. Knowledge and people's conceptions (and beliefs) of what reality is become embedded in the institutional fabric of society. Reality is therefore said to be socially constructed.

Nevertheless, the social sciences by themselves cannot adequately come to terms with the ontology of reality, in particular the urban reality. Leading urban researchers such as Manuel Castells, Janet Abu-Lughod and Saskia Sassen have recognized that the reality of the city cannot be understood from a single disciplinary perspective. Also, in two joint sessions of the British and American Sociological Associations held during the course of 2001, the conclusions pointed towards a necessity for interdisciplinarity and multidisciplinarity to enrich the perspectives within urban sociology.

Even if it seems appropriate to prescribe interdisciplinarity and multidisciplinarity for urban studies, this strategy would not solve the conceptual and epistemological problems of a field that faces the massive ontological transformations brought about by conditions of planetary urbanization. We are in need of a new perspective that goes beyond disciplines: a transdisciplinary perspective.

Transdisciplinarity is a new mode of inquiry, practice, and learning that places ethics, aesthetics, and creativity inside, not outside, of disciplinary and professional work.

"It brings new objects into view, places practices into new configurations, contextualizes and re-situates theory and learning, and incorporates social, political, and ethical questions once deemed beyond the proper sphere of research and education. The boundary work of transdisciplinarity is decidedly plural. It is generative, formative, and interrogative, catalyzing critique and transformations of our modes of inquiry, practice, and education. Transdisciplinary urbanism ought to be inquiry-driven rather than exclusively discipline-driven; meta-paradigmatic rather than intra-paradigmatic; informed by thinking that is complex, creative, contextualizing, and connective (following Edgar Morin); inquiry as a process of creative combining rigor and imagination" (Montuori, 2008, 36).

Transdisciplinary urbanism is then an attitude towards inquiry, informed by certain epistemological presuppositions, and an effort to frame inquiry as a creative process that recognizes as central the subjectivity of the inquirer and challenges the underlying organization of knowledge.

The Quantum Nature of Urban Reality: Beyond Object vs. Subject

Urbanism, as a knowledge enterprise, lies at the intersection of science and design, at the intersection of discovery and creation, and because of this, the epistemological essence of urbanism cannot be scientific realism or artistic subjectivity: it must be both. Urbanism must flesh out in convincing ways the dialectical interactions between the knowing subject and the object of knowledge.

Objectivity, set up as the supreme criterion of truth, has one inevitable consequence: the transformation of the subject into an object. The death of the subject is the price we pay for objective knowledge. The human being became an object—an object of the exploitation of man by man; an object of the experiments of ideologies that are proclaimed scientific; an object of scientific studies to be dissected, formalized, and manipulated.

The quantum revolution radically changed this situation. The new scientific and philosophical notions it introduced — the principle of superposition of quantum "yes" and "no" states, discontinuity, non-separability, global causality, quantum indeterminism — necessarily led the founders of quantum mechanics to rethink the problem of the complete object/subject separation.

"The concept of 'objective' and 'subject,'" writes Heisenberg, "designate[s…] two different aspects of one reality; however we would make a very crude simplification if we want to divide the world in[to] one objective reality and one subjective reality. Many rigidities of the philosophy of the last centuries are born by this black and white view of the world." "The too strong insistence on the difference between scientific knowledge and artistic knowledge comes from the wrong idea that concepts describe perfectly the 'real things.'

[…] All true philosophy is situated on the threshold between science and poetry" (Heisenberg 1998).

Heisenberg also asserts that we have to renounce the privileged reference to the exteriority of the material world – without suppressing it or denying its ontological status. "Beyond disciplines" precisely signifies the subject-object interaction, rooted in the logic of the *hidden third* and the *included middle*, as we shall see. The transcendence inherent in transdisciplinarity is the transcendence of the subject. The subject cannot be captured in a disciplinary camp. The meaning "beyond disciplines" leads us to an immense space of new knowledge. I follow Professor Basarab Nicolescu (2010) in his characterization of transdisciplinarity, levels of reality, the logic of the included middle, the hidden third, and complexity, which are the ontological and logical foundations to build a transdisciplinary approach to urbanism, but cannot discuss here due to space limitations. The core task of transdisciplinary urbanism is to explore the dialectical interactions between the knowing subject and the object of knowledge. For this task, one must keep in mind that uncertainty, indetermination, incompleteness and undecidability put serious limits to any attempt at establishing a closed system of knowledge.

Uncertainty[i]

In quantum mechanics (the nature of reality), there is no measurement procedure by which one can accurately measure the position of a system without disturbing it momentum, in the sense that some measure of inaccuracy in position and some measure of the disturbance of momentum of the system by the measurement cannot both be arbitrarily small. One striking aspect of the difference between classical and quantum physics is that whereas classical mechanics presupposes that exact simultaneous values can be assigned to all physical quantities, quantum mechanics denies this possibility, the prime example being the position and momentum of a particle.

Stated somewhat simplistically, according to quantum mechanics, the more precisely the position (momentum) of a particle is given, the less precisely can one say what its momentum (position) is. The uncertainty principle played an important role in many discussions on the philosophical implications of quantum mechanics, in particular in discussions on the consistency of the so-called Copenhagen interpretation, the interpretation endorsed by the founding fathers Heisenberg and Bohr. This should not suggest that the uncertainty principle is the only aspect of the conceptual difference between classical and quantum physics: the implications of quantum mechanics for notions as (non)-locality, entanglement and identity play no less havoc with classical intuitions. Quantitative uses of the terms uncertainty and risk are fairly consistent from fields such as probability theory, actuarial science, and information theory. Some also create new terms without substantially changing the definitions of uncertainty or risk.

For example, surprisal is a variation on uncertainty sometimes used in information theory. But outside of the more mathematical uses of the term, usage may vary widely. In cognitive

psychology, uncertainty can be real, or just a matter of perception, such as expectations, threats, etc.

Vagueness is a form of uncertainty where the analyst is unable to clearly differentiate between two different classes, such as 'person of average height' and 'tall person'. Ambiguity is a form of uncertainty where even the possible outcomes have unclear meanings and interpretations. The statement *"He returns from the bank"* is ambiguous because its interpretation depends on whether the word 'bank' is meant as *"the side of a river"* or *"a financial institution"*. Ambiguity typically arises in situations where multiple analysts or observers have different interpretations of the same statements.

Uncertainty may be a consequence of a lack of knowledge of obtainable facts. At the subatomic level, uncertainty may be a fundamental and unavoidable property of the universe. In quantum mechanics, the Heisenberg Uncertainty Principle puts limits on how much an observer can ever know about the position and velocity of a particle.

This may not just be ignorance of potentially obtainable facts but that there is no fact to be found. There is some controversy in physics as to whether such uncertainty is an irreducible property of nature or if there are "hidden variables" that would describe the state of a particle even more exactly than Heisenberg's uncertainty principle allows

Indetermination[ii]

An indeterminate system is a system of simultaneous equations (especially linear equations) which has more than one solution. The system may be said to be underspecified. If the system is linear, then the presence of more than one solution implies that there are an infinite number of solutions, but that property does not extend to nonlinear systems. An indeterminate system is consistent, the latter implying that there exists at least one solution. For a system of linear equations, the number of equations in an indeterminate system could be the same as the number of unknowns, less than the number of unknowns (an underdetermined system), or greater than the number of unknowns (an overdetermined system). Conversely, any of those three cases may or may not be indeterminate.

In linear systems, indeterminacy occurs if and only if the number of independent equations (the rank of the augmented matrix of the system) is less than the number of unknowns and is the same as the rank of the coefficient matrix. For if there are at least as many independent equations as unknowns that will eliminate any stretches of overlap of the equations' surfaces in the geometric space of the unknowns (aside from possibly a single point), so there cannot be more than one solution; and if the rank of the augmented matrix exceeds (necessarily by one if at all) the rank of the coefficient matrix then the equations jointly contradict each other, so there are no solutions.

Richard Dawkins, the man who coined the term meme in the 1970s, described the concept of faith in his documentary, *Root of All Evil?*, as "the process of non-thinking". In the

documentary, he used Bertrand Russell's analogy between a teapot orbiting the sun (something that cannot be observed because the brightness of the sun would obscure it even from the best telescope's view) and the object of one's faith (in this particular case, God) to explain that a highly indeterminate idea can self-replicate freely: "Everybody in the society had faith in the teapot. Stories of the teapot had been handed down for generations as part of the tradition of society. There are holy books about the teapot."

In *Darwin's Dangerous Idea*, Daniel Dennett argues against the existence of determinate meaning (in this case, of the subjective experience of vision for frogs) via an explanation of their indeterminacy in the chapter entitled *The Evolution of Meanings*, in the section *The Quest for Real Meanings*: "Unless there were 'meaningless' or 'indeterminate' variation in the triggering conditions of the various frogs' eyes, there could be no raw material [...] for selection for a *new* purpose to act upon. The indeterminacy that Fodor (and others) see as a flaw [...] is actually a prediction for such evolution [of "purpose"]. The idea that there must be *something determinate* that the frog's eye really means – some possibly unknowable proposition in froggish that expresses *exactly* what the frog's eye is telling the frog's brain – is just essentialism applied to meaning (or function). Meaning, like function on which it so directly depends, is not something determinate at its birth. [...]"

Dennet argues, controversially, against qualia in *Consciousness Explained*. Qualia are attacked from several directions at once: he maintains they do not exist (or that they are too ill-defined to play any role in science, or that they are really something else, i.e. behavioral dispositions).

They cannot simultaneously have all the properties attributed to them by philosophers—incorrigible, ineffable, private, directly accessible and so on. The multiple drafts theory is leveraged to show that facts about qualia are not definite. Critics object that one's own qualia are subjectively quite clear and distinct to *oneself*.

The self-replicating nature of memes is a partial explanation of the recurrence of indeterminacies in language and thought. The wide influences of Platonism and Kantianism in Western philosophy can arguably be partially attributed to the indeterminacies of some of their most fundamental concepts (namely, the Idea and the Noumenon, respectively).

It is important to note that indeterminacy in linguistics can arguably partially be defeated by the fact that languages are always changing. However, what the entire language and its collected changes continue to reflect is sometimes still considered to be indeterminate.

Incompleteness[iii]

As is known, Gödel's incompleteness theorems are two theorems of mathematical logic that demonstrate the inherent limitations of every formal axiomatic system containing basic arithmetic. These results, published by Kurt Gödel in 1931, are important both in mathematical logic and in the philosophy of mathematics.

The theorems are widely, but not universally, interpreted as showing that Hilbert's program to find a complete and consistent set of axioms for all mathematics is impossible.

The first incompleteness theorem states that no consistent system of axioms whose theorems can be listed by an effective procedure (i.e., an algorithm) is capable of proving all truths about the arithmetic of the natural numbers. For any such formal system, there will always be statements about the natural numbers that are true, but that are unprovable within the system. The second incompleteness theorem, an extension of the first, shows that the system cannot demonstrate its own consistency.

Gödel demonstrated the incompleteness of the system of *Principia Mathematica*, a particular system of arithmetic, but a parallel demonstration could be given for any effective system of a certain expressiveness. Gödel commented on this fact in the introduction to his paper, but restricted the proof to one system for concreteness. In modern statements of the theorem, it is common to state the effectiveness and expressiveness conditions as hypotheses for the incompleteness theorem, so that it is not limited to any particular formal system. The terminology used to state these conditions was not yet developed in 1931 when Gödel published his results.

In the transdisciplinary vision of Nicolescu (2010), every level of reality is characterized by its *incompleteness:* the laws governing this level are just a part of the totality of laws governing all levels. And even the totality of laws does not exhaust the entire Reality; we have also to consider the Subject and its interaction with the Object.

The zone between two different levels and beyond all levels is a zone of non-resistance to our experiences, representations, descriptions, images, and mathematical formulations. Quite simply, the transparence of this zone is due to the limitations of our bodies and of our sense organs—limitations that apply regardless of what measuring tools are used to extend these sense organs. We therefore have to conclude that the topological distance between levels is finite. However, this finite distance does not mean a finite knowledge. Take a segment of a straight line—it contains an infinite number of points. In a similar manner, a finite topological distance could contain an infinite number of levels of Reality.

This open structure of the unity of levels of Reality is in accord with one of the most important scientific results of the twentieth century concerning arithmetic, the theorem of Kurt Gödel, which states that a sufficiently rich system of axioms inevitably leads to results that are either undecidable or contradictory. The Gödelian structure of levels of Reality implies the impossibility of a self-enclosed, complete theory. In addition, the different levels of Reality of the Object are accessible to our knowledge thanks to the different levels of Reality of the Subject. They permit an increasingly general, unifying, encompassing vision of Reality without ever entirely exhausting it.

The unity of levels of Reality and its complementary zone of non-resistance constitutes what

we call the transdisciplinary Object. As in the case of levels of Reality of the Object, the coherence of levels of Reality of the Subject presupposes a zone of non-resistance to perception. The unity of levels of Reality of the Subject and this complementary zone of non-resistance constitutes what we call the transdisciplinary Subject.

Undecidability[iv]

There are two distinct senses of the word "undecidable" in mathematics and computer science. The first of these is the proof-theoretic sense used in relation to Gödel's theorems, that of a statement being neither provable nor refutable in a specified deductive system. The second sense, which will not be discussed here, is used in relation to computability theory and applies not to statements but to decision problems, which are countably infinite sets of questions each requiring a yes or no answer. Such a problem is said to be undecidable if there is no computable function that correctly answers every question in the problem set.

Because of the two meanings of the word undecidable, the term independent is sometimes used instead of undecidable for the "neither provable nor refutable" sense. Undecidability of a statement in a particular deductive system does not, in and of itself, address the question of whether the truth value of the statement is well-defined, or whether it can be determined by other means. Undecidability only implies that the particular deductive system being considered does not prove the truth or falsity of the statement. Whether there exist so-called "absolutely undecidable" statements, whose truth value can never be known or is ill-specified, is a controversial point in the philosophy of mathematics.

A decision problem is any arbitrary yes-or-no question on an infinite set of inputs. Because of this, it is traditional to define the decision problem equivalently as the set of inputs for which the problem returns *yes*. These inputs can be natural numbers, but also other values of some other kind, such as strings of a formal language. Using some encoding, such as a Gödel numbering, the strings can be encoded as natural numbers. Thus, a decision problem informally phrased in terms of a formal language is also equivalent to a set of natural numbers. To keep the formal definition simple, it is phrased in terms of subsets of the natural numbers.

Formally, a decision problem is a subset of the natural numbers. The corresponding informal problem is that of deciding whether a given number is in the set. A decision problem *A*is called decidable or effectively solvable if *A* is a recursive set. A problem is called partially decidable, semi-decidable, solvable, or provable if *A* is a recursively enumerable set. This means that there exists an algorithm that halts eventually when the answer is *yes* but may run for ever if the answer is *no*. Partially decidable problems and any other problems that are not decidable are called undecidable.

As Roy has pointed out, urban systems are undecidable. This clearly opens the way for new logical axiom (the hidden third and the logic of the included middle) at the core of urbanism understood in a transdisciplinary way.

Hidden Third[v]

Nicolescu´s ternary partition (Subject, Object, Hidden Third) is, of course, different from the binary partition (Subject vs. Object) of classical realism. The emergence of at least three different levels of Reality in the study of natural systems — the macro-physical level, the microphysical level, and the cyber-space-time (to which one might add a fourth level, that of superstrings, unifying all physical interactions)—is a major event in the history of knowledge. Based upon Nicolescu´s definition of levels of Reality, we can identify other levels than just the ones in natural systems. For example, in social systems, we can speak about the individual level, the geographical and historical community level (family, nation), the cyber-space-time community level, and the planetary level.

The whole is never given and that the beginning of understanding is always imminent. Fragmentation also mirrors a prime discovery that Nicolescu draws from his own area of scientific expertise, broken symmetry. Physicists now believe that a breakdown in laws of symmetry supplied the initial condition of the Big Bang. Thirdly, humans' relation to "Absolute Evidence" and to the cosmic order has ruptured.

The call, moreover, is blocked from our ears by deep habits of thought and language. Inherited from the ancient Greek world, their source lies in binary logic: either this or that but not both. Nicolescu's rejection of binary-ism is strong: "The fiendish dialectics of binary thought have the redoubtable yet subtle force of being able to kill in the name of ideas." The death consists in foreclosing the middle, the "third not given": what is there before and remains there after the division into two. Yet that death preserves in hiding the excluded element, which allows a direct perception of multiple levels of reality, up to that of Absolute Evidence. Fear of confronting a many-dimensioned cosmos lies behind the embrace of the binary. We opt for ready knowledge and survival of the status quo rather than participation in a work of co-creation. Because we fail to see the ambiguity in "yes or no," our spirit is blinded and put in shackles.

Logic can tell us that an inclusive (as opposed to a binary or exclusive) disjunction is triadic: this or that or both. It wagers on the contradiction contained in saying "both presence and absence." In the coincidence of opposites (Nicolescu's "Hidden Third"), reality hides. "Nature is in perpetual oscillation between constraint and chance, which is why it always chooses the Hidden Third." The job of the poet, to articulate contradictory reality, consists not so much in unveiling the Absolute Evidence as unveiling its concealment; the "theorems" of the poet are neither explanatory nor even understandable. They address us with respect to humanity's cosmic position and remember us to the mystery.

Logic of the Included Middle[vi]

The incompleteness of the general laws governing a given level of Reality signifies that, at a given moment of time, one necessarily discovers contradictions in the theory describing the respective level: one has to assert A and non-A at the same time. This Gödelian feature of the transdisciplinary model of Reality is verified by all the history of science: a theory leads

to contradictions and one has to invent a new theory solving these contradictions. It is precisely the way in which we went from classical physics to quantum physics. However, our habits of mind, scientific or not, are still governed by the classical logic, which does not tolerate contradictions.

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.

In fact, the logic of the included middle is the very heart of quantum mechanics: it allows us to understand the basic principle of the superposition of "yes" and "no" quantum states. Heisenberg was fully conscious of the necessity of adopting the logic of the included middle. "There is – writes Heisenberg – a fundamental principle of classical logic which seems to need to be modified: in classical logic, if one assertion has a meaning, one supposes that either this assertion or its negation has to be true. Only one of the sentences "There is a table here" and "There is no table here" is true: tertium non datur, i.e. there is not a third possibility and this is the principle of the excluded middle. […] In quantum theory, one has to modify this law of the excluded middle. If one protests again any modification of this basic principle, one can immediately argue that this principle is implicated in the ordinary language […]. Consequently, the description in ordinary language of a logical reasoning which does not apply to this language would mean simply a self-contradiction."

The included middle logic is a tool for an integrative process: it allows us to cross two different levels of Reality or of perception and to effectively integrate, not only in thinking but also in our own being, the coherence of the Universe. The use of the included third is a transformative process. But, at that moment, the included third ceases to be an abstract, logical tool: it becomes a living reality touching all the dimensions of our being. This fact is particularly important in education and learning.

Transdisciplinary Approach to Space[vii]

As said earlier, urbanism, as a knowledge enterprise, lies at the intersection of science and design, at the intersection of discovery and creation, and because of this, the epistemological essence of urbanism cannot be scientific realism or artistic subjectivity: it must be both. Urbanism must flesh out in convincing ways the dialectical interactions between the knowing subject and the object of knowledge. This applies to what is perhaps the central notion in urbanism: the concept of space. A transdisciplinary approach to space must take seriously the

interactions between the knowing subject (the phenomenological views of space) and the object of knowledge (space as currently understood, described and explained by the physical science). In the following pages, we shall try to apply the understanding of transdisciplinarity described in the previous section to an approach to urban space based on the dialectical interactions governed by physics and phenomenology.

Leibniz thought that space was in fact a collection of relations between objects, given by their distance and direction from one another. Later, Immanuel Kant said that the concepts of space and time are not empirical ones derived from experiences of the outside world—they are elements of an already given systematic framework that humans possess and use to structure all experiences. Kant referred to the experience of "space" in his *Critique of Pure Reason* as being a subjective "pure *a priori* form of intuition". Although there was a prevailing Kantian consensus at the time, once non-Euclidean geometries had been formalized, some began to wonder whether or not physical space is curved rather than flat. In 1905, Albert Einstein published his special theory of relativity, which led to the concept that space and time can be viewed as a single construct known as *spacetime*. Subsequently, Einstein worked on a general theory of relativity, which is a theory of how gravity interacts with spacetime. Instead of viewing gravity as a force field acting in spacetime, Einstein suggested that it modifies the geometric structure of spacetime itself. According to the general theory, time goes more slowly at places with lower gravitational potentials and rays of light bend in the presence of a gravitational field; in other words, space-time is geometrically distorted- *curved* -near to gravitationally significant masses.

Quantum Spacetime[viii]

Physical reasons have been given to believe that physical spacetime is a quantum spacetime. In quantum mechanics position and momentum variables are already noncommutative, obey the Heisenberg uncertainty principle, and are continuous. Because of the Heisenberg uncertainty relations, greater energy is needed to probe smaller distances. Ultimately, according to gravity theory, the probing particles form black holes that destroy what was to be measured.

Again, physical spacetime is expected to be quantum because physical coordinates are already slightly noncommutative. The astronomical coordinates of a star are modified by gravitational fields between us and the star, as in the deflection of light by the sun, one of the classic tests of general relativity. Therefore, the coordinates actually depend on gravitational field variables. According to quantum theories of gravity these field variables do not commute; therefore coordinates that depend on them likely do not commute.

We human beings still think in terms of a classical concepts. Positions, momenta, particles, fields, space itself. Quantum mechanics tells a different story. The quantum state of the universe is not a collection of things distributed through space, but something called a wave function. The wave function gives us a way of calculating the outcomes of measurements: whenever we measure an observable quantity like the position or momentum or spin of a

particle, the wave function has a value for every possible outcome, and the probability of obtaining that outcome is given by the wave function squared.

Indeed, that's typically how we construct wave functions in practice. Start with some classical-sounding notion like "the position of a particle" or "the amplitude of a field," and to each possible value we attach a complex number. That complex number, squared, gives us the probability of observing the system with that observed value.

Merleau-Ponty´s Conception of Space[ix]

In spite of its complexity, sophistication, and helpfulness for our purposes, the conception of space in physics falls short of fully describing the nature and structure of transdisciplinary space, and how it can be conceived in urbanism. As a field of both discovery and creation, urbanism belongs to two different levels of reality: the urban is both inseparable from the knowledge process and conceived in connection with the knowledge process. As postulated by Nicolescu (2010), only the non-resistance to our experiences, representations, descriptions, images, or mathematical formalisms (e.g., statistics) can bridge the abyss between two levels.

In addition to keeping in mind the particularities of spacetime as described by physics (the object of knowledge), the urban researcher ought to actively draw substantive and/or methodological conclusions for her/his work from the fact that his/her being is "being-in-the-world" in a phenomenological sense (the knowing subject). In a widely-known formulation by Henri Lefebvre, urban space can be perceived, conceived, and lived/imagined. We need, however, to further explore the idea of phenomenological urban space from a transdisciplinary perspective. We can see this point much clearer by briefly exploring Merleau Ponty´s phenomenology of space within his work Phenomenology of Perception (*PhP*).

The primitive structure of being-in-the-world is ultimately revealed through an integrated spatial archaeology which is nothing but Merleau-Ponty's phenomenology of space. The spatial archaeology of the lived body establishes the rootedness of consciousness in its body, while the spatial archaeology of the perceived world further reveals the primordial hold of the body on its world. Only by this integrated spatial archaeology can the general thesis of "being-in-the-world" be finally established. Space is one of the primordial expressions of our being-in- the-world.

We have first the conception of the spatiality of the body as an external object, an objective spatiality or "spatiality of position", related to what Merleau-Ponty freely calls "external space", "objective space" and "intelligible space". (*PhP*, 116ff/115ff). Thus defined, the relation between the body and space can only be termed as "a body *in* space", i.e. a ready-made, objective body located in determinate positions and occupying a fragment of the objective space.

However, the perceptual experience of the proper body, or our lived body, brings a different archaeological picture about spatiality. We discern in our bodily experience, not an objective

spatiality or a "spatiality of position", but a "spatiality of situation" in relation to the so-called "bodily space", "orientated space" and "lived space". (*PhP*, 116ff/115ff) The evidence is that the spatiality of the lived body cannot be defined by pure homogeneity and exteriority. When the lived body is engaged in a certain situation in face of its tasks, it displays various orientated distinctions, such as top and down, right and left, etc, and its parts are inter-related or enveloped in each other to fulfill its tasks. Thus bodily space can be distinguished from objective space by its necessary orientation and its ambiguity between interiority and exteriority.

The relationships between the two spatialities, according to Merleau-Ponty, comes to a "dialectic" of two dimensions: one is the relationship of founding and founded, the spatiality of the lived body is the founding and the objective spatiality the founded; the other is the relationship of expression and expressed, the objective spatiality is the "explicit expression" of the bodily spatiality as the expressed. (*PhP*, 118/117).

In order to establish the general thesis of being-in-the-world and re-define consciousness and world in their correlation, Merleau-Ponty tries to move from their irreducible distinction to their unity as a communicative relation, i.e. from the absolute difference of the two related terms to the unity of their inter-dependent relation. Since this reciprocal relation has been blurred and distorted to a unilateral, constructing one by the sedimented idealizations of intellectualism, he has to remove these idealizations through the archaeological inquiry and try to reveal this relation in perception as the primordial experience of being-in-the-world.

Obviously, this relation cannot be found in the matter of perception, but only in the form of perception, although the traditional form-matter relation should be re-considered against empiricism and intellectualism. Space is thus introduced as "a form of perception" (*PhP*, 281/283) into the whole phenomenological project in *PhP*. This argumentative intention explains Merleau-Ponty's persistent preference or adherence to a *relation- alist* notion of space rather than the substantialist or attributionalist one. He thus defines space as "the universal power enabling them [i.e. things] to be connected" (*PhP*, 281/284), or the setting of "co-existence" (*PhP*, 306/309).

This definition also brings to light the rootedness of Leibnizianism in *PhP*, whose influence will become more conspicuous in *The visible and the Invisible*. Hence Merleau-Ponty regards this relationalist notion of space as "the symmetrical notion" of the intentional structure of being-in-the-world. This explains why he thinks he is approaching the structure of being-in-the-world "in a more direct way by examining …the notion of space" (*PhP*, 281/283), and why he repeatedly chooses space perception as the example of his phenomenological analysis.

Phenomenology of Urban Space

To conclude, I will briefly describe some concepts that are key in a phenomenological approach to urbanism where the idea of the knowing subject as "being-in-the-world" captures the aim of transdisciplinarity at overcoming the division subject/object. Let´s not forget that reality, the object of knowledge, is "the continuous fluctuation of the experience as captured by

consciousness. In that sense, it can never be identified to a closed system," argues Heinsenberg.

By "experience," he understands not only scientific experiments but also the perception of the movement of the soul or of the autonomous truth of symbols. For him, reality is a tissue of connections and of infinite abundance without any ultimate founding ground. "One can never reach an exact and complete portrait of reality," he writes. The incompleteness of physical laws is therefore present in his philosophy, even if he makes no explicit reference to Gödel. A corollary of all of this is that scientific realism can only occur as a "bracketing out" of the phenomenological principle of "being-in-the-worldliness," an expression of the integration of the knowing subject within the object of knowledge.

Intentionality[x]

The term "intentionality" originated with the Scholastics in the medieval period and was resurrected by Brentano who in turn influenced Husserl's conception of phenomenology, who refined the term and made it the cornerstone of his theory of consciousness. The meaning of the term is complex and depends entirely on how it is conceived by a given philosopher. The term should not be confused with "intention" or the psychoanalytic conception of unconscious "motive" or "gain".

Intentionality refers to the notion that consciousness is always the consciousness *of* something. The word itself should not be confused with the "ordinary" use of the word intentional, but should rather be taken as playing on the etymological roots of the word. Originally, intention referred to a "stretching out" ("in tension," from Latin *intendere*), and in this context it refers to consciousness "stretching out" towards its object. However, one should be careful with this image: there is not some consciousness first that, subsequently, stretches out to its object; rather, consciousness *occurs as* the simultaneity of a conscious act and its object.

Intentionality is often summed up as "aboutness." Whether this *something* that consciousness is about is in direct perception or in fantasy is inconsequential to the concept of intentionality itself; whatever consciousness is directed at, *that* is what consciousness is conscious of. This means that the object of consciousness doesn't *have* to be a *physical* object apprehended in perception: it can just as well be a fantasy or a memory. Consequently, these "structures" of consciousness, i.e., perception, memory, fantasy, etc., are called *intentionalities*.

Intuition[xi]

Intuition in phenomenology refers to those cases where the intentional object is directly present to the intentionality at play; if the intention is "filled" by the direct apprehension of the object, you have an intuited object. Having a cup of coffee in front of you, for instance, seeing it, feeling it, or even imagining it – these are all filled intentions, and the object is then *intuited*. The same goes for the apprehension of mathematical formulae or a number. If you do not have the object as referred to directly, the object is not intuited, but still intended,

but then *emptily*. Examples of empty intentions can be signitive intentions – intentions that only *imply* or *refer to* their objects. 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 [...]"

Evidence[xii]

In everyday language, we use the word evidence to signify a special sort of relation between a state of affairs and a proposition: State A is evidence for the proposition "A is true." In phenomenology, however, the concept of evidence is meant to signify the "subjective achievement of truth." This is not an attempt to reduce the objective sort of evidence to subjective "opinion," but rather an attempt to describe the structure of having something present in intuition with the addition of having it present as *intelligible*: "Evidence is the successful presentation of an intelligible object, the successful presentation of something whose truth becomes manifest in the evidencing itself."

Empathy and Intersubjectivity[xiii]

In phenomenology, empathy refers to the experience of one's own body *as* another. While we often identify others with their physical bodies, this type of phenomenology requires that we focus on the subjectivity of the other, as well as our intersubjective engagement with them. In Husserl's original account, this was done by a sort of apperception built on the experiences of your own lived-body. The lived body is your own body as experienced by yourself, *as* yourself. Your own body manifests itself to you mainly as your possibilities of acting in the world. It is what lets you reach out and grab something, for instance, but it also, and more importantly, allows for the possibility of changing your point of view. This helps you differentiate one thing from another by the experience of moving around it, seeing new aspects of it (often referred to as making the absent present and the present absent), and still retaining the notion that this is the same thing that you saw other aspects of just a moment ago (it is identical). Your body is also experienced as a duality, both as object (you can touch your own hand) and as your own subjectivity (you experience being touched).

The experience of your own body as your own subjectivity is then applied to the experience of another's body, which, through apperception, is constituted as another subjectivity. You can thus recognise the Other's intentions, emotions, etc. This experience of empathy is important in the phenomenological account of intersubjectivity. In phenomenology, intersubjectivity constitutes objectivity -- i.e., what you experience as objective is experienced as being intersubjectively available to all other subjects. In the experience of intersubjectivity, one also experiences oneself as being a subject among other subjects, and one experiences oneself as existing objectively *for* these Others.

Epilogue

If massive geohistorical developments pose a fundamental challenge to the entire field of urban studies (its basic epistemological assumptions, categories of analysis, and object of investigation), then a satisfactory answer cannot come from within urban studies, but rather

from a transdisciplinary perspective "beyond and between disciplines" that rejects scientific realism and uses its own, distinct epistemological axioms to flesh out the interactions between object and subject (knowledge and design, discovery and creation) in research as the preliminay foundation for a new reconceptualization of the field.

If one wants to point out the limitation of the concept of "city" for empirical research, it is certainly not helpful to propose instead the study a situation of complete urbanization with no alternatives in empirical reality. We would say that a field of study focused on a situation of complete urbanization has no defined object: it is all reality and, therefore, no reality. It is necessary to establish distinctions between the urban and that which is not urban, or establish levels of urbanity. Because of this, the complete urbanization vision for urbanism defeats itself as a heuristic strategy.

In sum, the research area of complete urbanization or planetary urbanization is welcome and deserves credit, but it exhausts itself and perishs if we take it to to its logical conclusion, due to the lack of demarcation criteria. This lack would cause, paradoxically, the dissolution of the research field these authors are attempting to refound. The paradigm of planetary urbanization would then become an updated version of empirical research around the political economy of global capitalism broadly understood. In planetary urbanization, the urban disappears from the equation due to the absence of the non-urban. It is appropriate to recognize planetary urbanization as a global empirical development of our times, but once we have done so we must define and limit our object of study and, for this endeavor, we probably ought to keep using the old spatial concepts associated to "the city" in its various manifestations. The key is not to replace "the city" with "the urban," but rather to use both in dialectical and complementary ways.

The social sciences by themselves cannot adequately come to terms with the ontology of reality, in particular the urban reality. Leading urban researchers such as Manuel Castells, Janet Abu-Lughod and Saskia Sassen have recognized that the reality of the city cannot be understood from a single disciplinary perspective. In two joint sessions of the British and American Sociological Associations held during the course of 2001, the conclusions pointed towards a necessity for interdisciplinarity and multidisciplinarity to enrich the perspectives within urban sociology. Even if it seems appropriate to prescribe interdisciplinarity and multidisciplinarity for urban studies, this strategy would not solve the conceptual and epistemological problems of a field that faces the massive ontological transformations brought about by conditions of planetary urbanization. We are in need of a new perspective that goes beyond disciplines: a transdisciplinary perspective.

Urbanism, as a knowledge enterprise, lies at the intersection of science and design, at the intersection of discovery and creation, and because of this, the epistemological essence of urbanism cannot be scientific realism or artistic subjectivity: it must be both. Urbanism must flesh out in convincing ways the dialectical interactions between the knowing subject and the object of knowledge. This applies to what is perhaps the central notion in urbanism: the concept

of space. A transdisciplinary approach to space must take seriously the interactions between the knowing subject (the phenomenological views of space) and the object of knowledge (space as currently understood, described and explained by the physical science). “Beyond disciplines” precisely signifies the subject-object interaction, rooted in the logic of the *hidden third* and the *included middle*. The transcendence inherent in transdisciplinarity is the transcendence of the subject. The subject cannot be captured in a disciplinary camp. In a phenomenological approach to urbanism the idea of the knowing subject as “being-in-the-world” expresses the integration of the knowing subject within the object of knowledge, and it captures the aim of transdisciplinarity at overcoming the division subject/object. Let´s not forget that reality, the object of knowledge, is the continuous fluctuation of the experience as captured by consciousness. In that sense, it can never be identified to a closed system. By “experience,” we understand not only scientific experiments but also the perception of the movement of the soul or of the autonomous truth of symbols. Reality is a tissue of connections and of infinite abundance without any ultimate founding ground. One can never reach an exact and complete portrait of reality. The incompleteness of physical laws is therefore present in any transdisciplinary approach to urbanism, which means we need to theorize ontological pluralism and aim at using middle-range theories (Merton) for our endeavors.

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