

## #13

### LAYING THE FUNDAMENTALS

#### Early methods and intentions from the outskirts of space syntax

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##### ABSTRACT

Forty years following the 'Space Syntax' paper by Hillier, Leaman, Stansall and Bedford (1976), where its research programme was presented, in this 2017 11th SSS this paper aims to reflect upon the early breakthroughs that have led to all the subsidiary outcomes and technical advancements brought by this innovative approach from the 1970s.

Hence, this paper will address the research context amongst which space syntax has been established, regarding its methodological nature, but foremost as an answer to the Unit for Architectural Studies' research concerns, in which it was originally implemented. Thus, it will acknowledge the specificities of this contemporary research context, on its theoretical conjuncture, the construction of its fundamental body of knowledge, as well as its organic structure within the context on the mentioned Research Unit, established in July 1967 at the Bartlett School of Architecture.

Accordingly, the outputs of the research contents, but also of its methodological procedures, will be critically analysed, regarding the research initially developed by Hillier and Leaman, then still at the Intelligence Unit of the RIBA and their initial theoretical production. With Leaman, Hillier would present 'The architecture of architecture' in 1973, at the Second Conference of the Centre for Land Use and Built Form Studies. And along with Musgrove, from the Unit for Architectural Studies, Hillier and O' Sullivan would present their outcomes at the third EDRA (1972).

The overall relevance and originality of this proposal lays in its informed reassessment towards architecture, but also to other study fields, whose contribution plays a relevant role in the decision process, as proven by the expanding thematic approaches of the latest Space Syntax Symposia. Moreover, broadening the technological advancements could be lined with an understanding of the theoretical fundamentals that ground space syntax research.

So, the theoretical stabilisation of these concepts in the early 1970s would be seminal to the establishment of space syntax, as the advancement of an artificial understanding of spatial surfaces through aggregation modes, as a pre-topological approach and a still elementary syntax, envisioning a "social logic of space" (Hiller and Hanson, 1984). This acknowledgment would contribute, in the 1980s, to a possible relation between theory and practice, ultimately confirming Hillier's proposal of linking both realms through research in 1969, when he was considered by the RIBA (1969) to be "the RIBA's second youngest assistant secretary at 32, [as] the nearest thing we have to a long-haired intellectual".

## KEYWORDS

Elementary Syntax, Aggregation Modes, Social Logic of Space, Unit For Architectural Studies

## 1. INTRODUCTION

Forty years following the 'Space Syntax' paper by Hillier, Leaman, Stansall and Bedford (1976), where its research programme was presented, in this 2017 11th SSS this paper aims to reflect upon the early breakthroughs that have led to all the subsidiary outcomes and technical advancements brought by this innovative approach from the 1970s.

Firstly, the research context behind the early beginnings of space syntax will be outlined from an initial social emphasis brought to the Bartlett School of Architecture by Richard Llewelyn-Davies's pioneer architectonic and experimental behaviourist studies at the Nuffield Foundation Division for Architectural Studies founded in 1954, and subsequently introduced by the Unit for Architectural Studies (UAS) established in 1967, with John Musgrove as its director.

Furthermore, the interrelation between Musgrove's studies at the UAS and Bill Hillier's early theoretical work at The Royal Institute of British Architects (RIBA) Education Committee at the end of the 1960s, followed by his relevant role behind the RIBA's Intelligence Unit, will be reviewed, mainly by their mutual participation in the Editorial Board that founded the *Journal of Architectural Research and Teaching* in 1970. This would be a mediating platform for the publication of the research work from many epistemological provinces, generally resulting from studies developed in research centres, many of them founded in 1967, as the UAS, the Building Performance Research Unit by Thomas Markus at the University of Strathclyde, or the Centre for Land Use and Built Form Studies by Leslie Martin at the University of Cambridge, with Lionel March and Philip Steadman.

Secondly, the presentation of original studies and theoretical backgrounds and developments, will prove the stabilisation of a conceptual framework for space syntax during the 1970s. This will be undertaken through a critical re-reading of direct sources, mainly Bill Hillier's and Adrian Leaman's papers, either from the RIBA's Intelligence Unit or from the Unit for Architectural Studies at the Bartlett, while also considering the outputs of subsequent studies and the contribution of Julienne Hanson's research from the second half of 1970s to the seminal 1984's *The social logic of space* (Hillier and Hanson, 1984).

Finally, it is expected that the systematization of the theoretical background of *The social logic of space* may potentially trigger a contemporary critical implementation of instrumental procedures and interpretations, as valuable means for restating architectural and social concerns as ineluctable research ends.

## 2. THE 'SUBJECT MATTER OF ARCHITECTURAL RESEARCH'<sup>1</sup>

The conceptual framework of space syntax, its early methodological experimentations and subsequent stages of increasing complexity, have been fostered by a research culture intensified during the 1960s. During that timeframe, architects associated research directly with the urgency of building reconstruction, at the aftermath of the Second World War and with a consequent social empowerment provided by the Welfare State.

Amongst the architects in-between practice and research, Robert Matthew and Leslie Martin, after prominent efforts at the London County Council, have both become architectural school directors, respectively at the University of Glasgow and at the University of Cambridge. Martin's famous speech at the 1958 RIBA's Oxford Conference on Architectural Education stated that: "Research is the tool by which theory is advanced. Without it teaching can have no direction and thought no cutting edge." (Martin, 1958, p.280). This would already constitute a sign of a research culture that was being forged and expanded.

1 After Bill Hillier's paper entitled 'Psychology and the subject matter of architectural research' (1970).

Ultimately, it resulted in the creation of several research structures within architectural schools during the second half of the 1960s. That was the case of the Centre for Land Use and Built Form Studies in Cambridge, founded by Leslie Martin along with Lionel March in 1967. It was also the case of the Unit for Architectural Studies at the University College London implemented in the same year by John Musgrove, which was a direct result of Richard Llewelyn-Davies' promotion of research in architecture on several fronts, as director of the Bartlett in 1960.

In fact, Llewelyn-Davies assumed a mediating position between the practice and the research since his 1950s experience as principal coordinator of the Nuffield Foundation Division for Architectural Studies, where he reinforced the establishment of a specific body of knowledge in new hospital facilities. His research team, which was also constituted by John Weeks and later by John Musgrove, developed pioneering survey studies with several experimental methodologies that would constitute an important input to inform the design of new hospital wards. Besides a theoretical approach on the recognition of change and indeterminacy (Weeks, 1964), one of the most innovative methods was the recording of the nurses' typical day-work movements, by means of string diagrams, in which threading string corresponded to pathways on a plan.

This example epitomises the emergence of architectural studies as a theoretical background for the practice, in which research might constitute a "substitute for tradition", as Llewelyn-Davies assumed by saying 'Deeper knowledge, better design' (1957):

*'It is in some ways the only substitute we have for tradition. Tradition was built up after a long period of trial and error. They tried all sorts of rooms, windows, etc., over many years, research of a slow and very expensive kind. Now we can't afford to do that; we must use more intensive methods, to get the old quality into architectural design.'* (Llewelyn-Davies, 1952, p.105)

Reyner Banham (1960, p.93) as the editor of *The Architectural Review*, would invite Llewelyn-Davies to present his ideas on this dichotomy between "tradition-technology". In his paper 'Human Sciences' Llewelyn-Davies (1960) introduced social sciences as an increasing expanding field in regard to architecture, interrelated with the conceptualization of the environment, which would strengthen a research panacea under diverse contexts.

Right next to Llewelyn-Davies, Peter Cowan and Newton Watson at the Bartlett, supported a synthesis between architecture and people, where, as Martin put it, "research is the tool" for knowledge advancement towards the lived environment:

*'Buildings begin with people. Architecture should not be a formal or production-derived solution imposed upon the users, but a growing together of human needs and the industrial equation. Somewhere a synthesis occurs; at this point stands someone – call him architect or what you will – reconciling not leading – creating not directing – not an amateur of other disciplines, but a profession in this task. As our knowledge of human physiological requirements deepens, creative design becomes easier. The multi-disciplinary team is the organisation, research is the tool, and science the discipline which will push our vocation forward in the second half of this century. Buildings end with people.'* (Cowan and Watson, 1961, p.744).

It was precisely the study on the interconnection between buildings and people that established the problematics for the first study under John Musgrove's coordination, entitled *The Use of Space and Facilities in Universities*, which laid the foundations for setting up the UAS in July 1967. Its first report (Unit for Architectural Studies, 1968), presented the implemented methodology, explaining how the correlations between spaces and activities could be optimised, while recurring to IBM Port-a-punch cards to collect real activities' data [Figure 1].

SURVEYOR	DATE		PTO FOR NOTES		ROOM USE		REV CAT		E		S		P		D		C		B		A		H		L		I		T		R		P		S		E	
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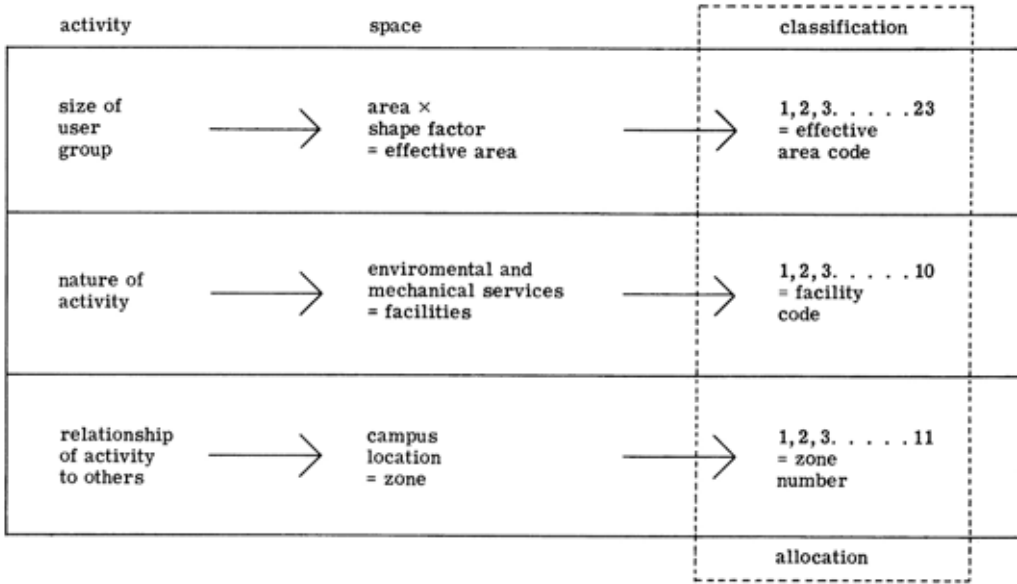


Figure 1 - Port-a-punch card used for collecting room survey data and main classification categories, The Use of Space and Facilities in Universities, UAS, UCL. (Musgrove and Doidge, 1970, p.3). Courtesy RIBA Collections

These implementations were presented in 1971 at a research fair, as one of the events that sustained the generalisation of architectural research amongst the schools of architecture. This fair was organised by Thomas Markus at the University of Strathclyde, where he founded the Building Performance Research Unit in 1967, which also implemented studies on the interrelation of activities and spaces with particular focus on secondary schools (Markus, 1972).

The research front in architecture, here embodied by Markus and Musgrove, epitomised a profile of the architect that interacted in the midst between art and science, embodying the interconnection between *The Two Cultures* (Snow, 1959). Actually, if both were entrepreneurial in introducing a culture of research into architecture, they were also involved in a strong expressive artistic realm. Markus was close to the Glasgow School of Arts, while Musgrove extensively read "history, philosophy of technology and science, and novels from Dickens to

Durrell" (The Architects' Journal, 1972, p.1124).

This connection was also translated onto the University of Strathclyde, encouraging the relation with other disciplines, as the pioneer conference Architectural Psychology revealed. Here Bill Hillier (1970), still secretary of the RIBA, presented one of his early papers entitled 'Psychology and the subject matter of architectural research', which revealed the intrinsic fragilities of empiric research and induction, reporting to Popper's (1962) *Conjectures and Refutations*.

Thus, Hillier was becoming the RIBA's role model for a delegate concerned with the intermediation between the theory and the practice, considered by the RIBA (1969) to be "the RIBA's second youngest assistant secretary at 32, [as] the nearest thing we have to a long-haired intellectual" [Figure 3]. Ultimately, by leading the RIBA's Intelligence Unit, Hillier would share with Adrian Leaman the committed role of reflecting upon fundamental views, relating simultaneously research and theory, profession and practice, which was unusual until that moment within a professional organism as the RIBA.



Figure 3 - Bill Hillier, at 32 years old, as assistant secretary of the RIBA. (Royal Institute of British Architects, 1969, p.426) Courtesy RIBA Collections

The main proof of the relocation of architectural research, between the education and the profession, would be the creation of the *Journal of Architectural Research and Teaching* (ART), first published in May 1970 [Figure 3]. The first numbers from ART framed strategies for architectural research, translated onto a compilation of several research papers. But Hillier also reflected upon the relations between architecture and the profession, as well as other professions like engineering (Hillier, 1972).



Figure 4 - The covers of the three first numbers of volume 1 of the Journal of Architectural Research and Teaching. (Architectural Research and Teaching, 1970a, 1970b, 1971, covers) Courtesy RIBA Collections

Consequently, if education and the profession were profoundly discussed since the 1950s, only at this point were the effective links between both realms being surveyed and problematized through research, as exemplified by the research *Schools of Architecture and the Profession*, carried out by the UAS between 1972 and 1974.

In 1974 Hillier would assume, along with John Musgrove as the main editor of the UK board, the transformation of the ART into the *Journal of Architectural Research* (1974), translating it into a cross-Atlantic publication, co-published by the RIBA and the American Institute of Architects. This change envisioned a broader repercussion of the 'subject of architectural research', even if in 1975, O'Sullivan, Territt, Musgrove, Hillier and Leaman, recognised the struggles behind a continued research programme lacking institutional and financial support that would hinder much of the future of architectural research.

However, the main causes for an undefined future were actually of an epistemological nature. Therefore, in what concerned the assessment of the interactions between subjects and artefacts, theoretical divergences were behind an epistemological fracture within the research culture of "structuralism" as Hillier and Leaman (1973)<sup>2</sup> would argue. Actually, after Llewelyn-Davies founded an environmental school at the Bartlett (School of Environmental Studies), Hillier and Leaman, while teaching at the MSc course in environmental theory, reflected upon the contradictions within the research paradigm between man and the environment, leading to their influential paper 'The man-environment paradigm and its paradoxes' (1973). As they sustained, structuralism proposed a paradigmatic alternative through a "simple yet profound change: the paradigmatic substitution of logical space for spatial space" (*ibid.*, p.510). Thus, by recurring to Piaget's *Biology and Knowledge*' (1971) in their text, instead of a logic of space, the authors would recognise the research path to pursue a "social logic of space":

*'We exist not in 'spatial space' pure and simple, but in spatial space as it has been constructed in terms of the contents and structures of logical space. This has happened, Piaget-wise, through our cognitive activity by which we have made sense of the world, retaining as we go the structure of that understanding, and developing it to assimilate new experiences as they occur in real space.'* (Hillier and Leaman, 1973, p.510)

That was the assumption of the concept that would construct the theory of space syntax and its fundamental roots on *The social logic of space* (Hillier and Hanson, 1984) as the natural output of a syntactic assessment of space and as "the generator – of social relations":

2 We thank to the anonymous referee for reminding the relevance of Hillier and Leaman's text to the theory of space syntax and the epistemological change in the structuralist approach of the man-environment paradigm.

*'By giving shape and form to our material world, architecture structures the system of space in which we live and move. In that it does so, it has a direct relation - rather than a merely symbolic one - to social life, since it provides the material preconditions for the patterns of movement, encounter and avoidance which are the material realisation - as well as sometimes the generator - of social relations.'* (Hillier and Hanson, 1984, p.ix)

### 3. THE OUTSETS OF SPACE SYNTAX

The comparisons between theoretical findings and conceivable breakthroughs will be crucial to report the framework of space syntax as a research field, as we have seen, based on a research culture shared between studies enrolled in several research centres in the early 1970s.

This was the context shared between architecture schools and the RIBA, lived in and stimulated by Bill Hillier's early studies, which progressively tended towards a rationality behind the design at the outsets of space syntax, and that could complement reality, as the culmination of architecture, as he pointed out in 1970: "Get involved in design so that hypotheses can be tested by that marvellous available instrument, the real building." (Hillier, 1970, p.29).

Accordingly, the outputs of the research contents, but also of its methodological procedures, will be critically analysed, regarding the research initially developed by Hillier and Leaman, then still at the Intelligence Unit of the RIBA and their initial theoretical production. Hillier and Leaman would present 'The architecture of architecture' in 1973, at the Second Conference of the Centre for Land Use and Built Form Studies, published in 1975. And along with Musgrove, from the Unit for Architectural Studies, Hillier and O' Sullivan (1972) would present their outcomes at the Third Environmental Design Research Association (EDRA).

Correspondingly with Hillier's reflection upon architecture and engineering, the paper 'Knowledge and Design' (Hillier, Musgrove and O'Sullivan, 1972) regarded (environmental) research and its connection to the (design) practice. It clearly pointed out the need to diminish the "applicability gap" of research towards the design and to tackle its "credibility gap" (*ibid.*, p.2). Under this contextual framework of the beginning of the 1970s, architects developed design concerned with the practice, rather than knowledge for that practice, which was accorded to other realms of study (*ibid.*). Generally, by refusing a definite knowledge or a set of rules of thumb, this approach drew near the design and the theory, acknowledging that:

*'Such theories are not pseudo-deterministic ways of telling the designer what will be the outcome of his design, but strong and cumulatively developing bases for conjecturing possible futures.'* (Hillier, Musgrove and O'Sullivan, 1972, p.14).

Following this connection between design and environment, and the assumption of the paradigm's paradoxes in 1973, the subsequent paper by Hillier and Leaman (1974), 'How is design possible', stated that "if design method is to be improved then it is more important to study the environment itself than how designers design" (*ibid.*, p.4), while considering "how designers' internal models transform environmental reality".

This recalled the previous 1972 (Hillier, Musgrove and O'Sullivan) idea of the building as a "climate", "behaviour", "cultural" and a "resource modifier" (*ibid.*, p.12). Even though this was further developed in this paper, in which the authors advanced a more structured framework for these conditions, namely that the "man-man" relation regards the building as a "behaviour modifier", whereas the "man-nature" relation regards the building as a "climate modifier" (Hillier and Leaman, 1974, p.8) [Figure 5].

Additionally, already in this paper Hillier and Leaman (1974, p.6) addressed "morphology" and "structure" and referred to a:

*'[...] theoretical approach to space where the fixity of artificial space [...] becomes a primary factor. Such a theory begins with the observation that the simplest structures in environmental action are already complex structures.*

*Such elementary structures, given that they are identifiable, will contain within themselves rules*

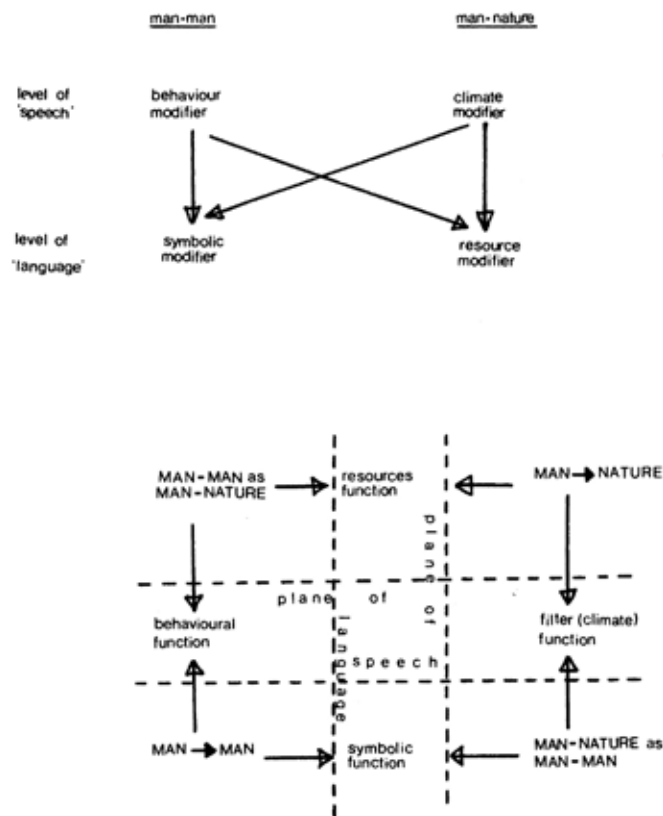


Figure 5 - The four-function model as a structure (two versions)  
(Hillier and Leaman, 1974, p.8) Courtesy RIBA Collections

for combination into the higher-order aggregations which give the spatial structure characteristics of urban and other higher-order spaces, as mappings of social processes.’ (Hillier and Leaman, 1974, p.10)

This latest remark on the “mapping of social processes” could induce the future “social logic of space” (Hillier and Hanson, 1984). Furthermore, the identification of rules of combination of structures and the reference to morphology, could be understood as an anticipation of the ‘Space Syntax’ paper (Hillier, Leaman, Stansall, Bedford, 1976).

But just one year afterwards, Hillier and Leaman published ‘The architecture of architecture: Foundations of a mathematical theory of artificial space’ (1975), within the proceedings of the second conference of the LUBFS, that elaborated on “morphologies and codes” (*ibid.*, p.6-8), “spatial surfaces and aggregation modes” (*ibid.*, p.10-12) and presented an “elementary syntax of spatial structures” (*ibid.*, p.12-16).

So, in 1976 the paper ‘Space Syntax’ by Hillier, Leaman, Stansall and Bedford, which started by questioning: “how and why different societies produce different spatial orders through building forms and settlement patterns” (*ibid.*, p.147), is paramount for the establishment of space syntax, as “a general syntactic theory of space organization” (*ibid.*).

Structurally, this paper first locates this theory as a “morphic language” that is “used to constitute rather than represent the social through their syntax (that is the systematic production of pattern)” (*ibid.*) and grounds it, between the mathematical and the natural language, from which it resembles, but also differs (*ibid.*, p.152).

In fact, during the first part of the paper, it addresses the search for the recognition and representation of the “inherent formal structures” (*ibid.*, p.148) to understand spatial and social patterns (*ibid.*). For that purpose, and under a yet emergent search on the methods, the “syntactic” choice is here justified, rather than a mathematical straightforward approach (*ibid.*, p.149).



Additionally, the paper explains the aim of the “theory of morphic languages” in “understanding how the morphology may be generated from a parsimonious set of elementary objects, relations and operations” (*ibid.*, p.149-150). Syntax plays here a prominent role, which in a morphic language is defined as “a set of related rule structures formed out of elementary combinations of the elementary objects, relations, and operations.” (*ibid.*, p.150).

Furthermore, in this paper, influential concepts of space syntax already appeared, such as: “local” vs “global” (*ibid.*, p.153), “betweenness” (*ibid.*, p.157) vs “insiderness” (*ibid.*, p.173),... and it described the postulates, the advantages and its lexicon.

Lastly, it is emphasised that the paper presents an untested theory (*ibid.*, p.179), which is not “causal” or a “reflection” (*ibid.*) of society and space, but that it is the most exact one that engages syntax with social relationships, whose further developments would also lie in the clarification of this relation. This is the case of the paper ‘Creating life: or, does architecture determine anything?’ by Hillier, Burdett, Peponis and Penn (1987), which examined in detail whether “architectural design create[s] a pattern of spatial life” (*ibid.*, p.234), ending with the suggestion that “cities are not so much mechanisms for generating contact as mechanisms for generating a potential field of probabilistic co-presence and encounter” (*ibid.*, p.248) with a “definite and describable structure” (*ibid.*).

Besides urban analysis, space syntax has also proven relevant on the analysis of designs for building interventions, as regarded in the several National Gallery Hampton site proposals, which have already been analysed by axial and convex maps (Hillier, Peponis and Simpson, 1982).

In 1983 a paper under the same title: ‘Space Syntax’, by Hillier, Hanson, Peponis, Hudson and Burdett, was published in *The Architects’ Journal*, which developed this theory further on and closer to what would be presented in the 1984 Hillier and Hanson’s *The social logic of space*.

This paper already clarified the principles of space syntax and its testing at the Bartlett, having applied it to “more than 100 towns, urban areas and design proposals, and the systematic observation of 15 examples” (Hillier, Hanson, Peponis, Hudson and Burdett, 1983). One of the focused examples is London’s Limehouse Basin, for which four design proposals have been analysed, besides the existing urban tissue. And despite the choice in the proposal, the research showed that the analyses of the existing structure tackled its respective problems and assets and also acknowledged the spatial requirements for bettering its movement and social interaction.

In addition to the fact that this paper presented a well-defined description of space syntax, it held an appendix with the concepts that it took up, and it perceived its purposes and advancements very clearly. It also concluded on the relevance of spatial order towards cognition and behaviour (*ibid.*, p.49):

*‘Nevertheless our results show unequivocally that the spatial organisation of towns and urban areas affects patterns of movement and use according to well defined principles, which relate to intelligibility of space [...]; the continuity of occupation [...]; and the predictability of space [...].’* (Hillier, Hanson, Peponis, Hudson and Burdett, 1983, p.49)

Lastly, it strongly acknowledged space syntax as an advancement for urban design, by providing an understanding of the existing situation that could ultimately inform future designs:

*‘Space syntax is therefore both a method and a message, and it would seem to open up new perspectives to urban design. It gives a rational way of approaching urban design ‘top down’, so that anyone can participate in the decision taking process from the ‘bottom up’. Space syntax allows the structure of the area to suggest new possibilities. Above all, it is a way of looking at the oldest problem of all in urban design: how to add the new to the old.’* (*ibid.*, p.63)

However, the reception of the space syntax method by *The Architects’ Journal’s* readers expressed “major reservations” like Richard MacCormac (*The Architects’ Journal*, 1983, p.14) who, even considering the “intelligibility of a locality” as relevant, argued that “space syntax describes formal characteristics of urban space and I do not feel that a measurable relationship

between these and urban experience is established”.

The only exception on this debate was Thomas Markus, who actually believed in its potentialities, rather than a “mission impossible”. Hence, this could be one of the early signs that revealed subsequent divergent approaches to the man-environment paradigm, foreseen by Hillier and Leaman ten years earlier (1973).

#### 4. CONCLUSIONS: A SPACE SYNTAX CRITICAL RETROFITTING

The First Space Syntax Symposium took place in 1997, for an already established research community. Its opening lecture by Hillier and Hanson (1997) reflected upon the progressive development of space syntax, both as a method but foremost as a theory: “the analytical theory of architecture” (*ibid.*, p.1). This recalled the early papers when Bill Hillier was at the RIBA’s Intelligence Unit while searching for the fundamentals of an architectural theory, which now holds specificities and mechanisms that structure and describe spatial configuration in regard to social relations.

Overall, the case studies and situations in which to apply space syntax have been gradually widened, its disciplinary scope has gained a broader extension, and a potential transdisciplinarity can be perceived, which has been stated promptly in Hillier’s (1996) *Space is the machine*:

*‘At present we are encouraged by the current interest in these ideas across a range of disciplines and, just as the last decade has been devoted to the development and testing of techniques of configurational analysis within architecture and urban design, so we hope that the coming decade will see collaborations amongst disciplines where configuration is identified as a significant problem, and where some development of the configurational methodology could conceivably play a useful role.’* (Hillier, 1996, p.2)

Simultaneously, Hillier and Hanson (1997) stated that space syntax goes along with “design intuition” for the understanding of the possibilities:

*‘Space syntax works with, not against, design intuition, and generates new generic possibilities for design intuition to explore rather than simply constraining design. It can do this precisely because it is a theory, and could not do this if it were not. [...] Space syntax makes the deployment of nondiscursive intuition more rational and therefore more discursive. It aids design as what it is: the reasoned deployment of intuition. Architecture remains, as ever, the reasoning art.’* (Hillier and Hanson, 1997, p.4-5)

Both of the quotes above revealed the will to broaden space syntax’s scope and potential as a theory, in its interconnections to other means of approaching space and society.

Hillier’s reference to “collaborations amongst disciplines”, may imply a way of surpassing the paradoxes on the man-environment paradigm, foreseen in the early paper with Leaman (Hillier and Leaman, 1973). These paradoxes have certainly contributed to the delimitation of the theoretical fundamentals of space syntax and its subsequent developments. Actually, in its outset, by concentrating its methods in securing a rigorous and stable assessment of the structural logics that influence social relationships in space, the theory became intentionally biased by not taking into account subjects’ sensorial experience and intentions and, thus, without aiming to resolve the holistic complexity of social encounters.

At the same time, this theoretical assertiveness brought some arguments from several critics, pointing out fragilities that were, from the beginning, outside of the fundamentals proposed by the theory. The recent clarification of the field’s limitations, by Vinicius Netto (2015) when questioning “What space syntax is not”, while systematically identifying the intrinsic goals of space syntax’s theory, also underlines its abstraction when it reduces “social practice” and “the actors” to syntactic measurements.

From opposing epistemologies many of the controversies have grown towards space syntax, as we have seen in the publication ‘Mission Impossible’ (The Architects’ Journal, 1983). Hence, more than a permanent and unresolved fracture, questions can be placed on how far

the confrontation between space syntax and divergent theories, might constitute a way of surpassing the above paradoxes, while respecting their mutual fundamentals.

From the three different possibilities pointed by Netto (2015, p.8) to this “epistemological dilemma” on the future of theory – “maintenance and reproduction”; “rupture”; or “adaptation and evolution” – we argue for the critical dialogue between theories, and a constructive triangulation of their original principles.

Hence, more than adapting and envisaging an expanded theory through its adaptation, its interaction with other theoretical contributes would comply with a critical and more complete sociospatial assessment, such as attempted in recent researches (Coelho and Krüger, 2015). This particular research associated space syntax with other approaches for assessing adaptability in educational spaces, in order to reach a more thorough conclusion on the relation between space and the learning experience, whose “[...] final outcome potentially provides a comprehensive outlook on spatial analysis and a methodological development on architectural research, to be applied to other design briefs.” (*ibid.*, p.2)

Already in ‘Morphology and Design’, Hanson (2001) aimed at expanding the field towards the intellect, intuition and ethics, in the reflective practice of architecture, for the Third Space Syntax Symposium, where it is recalled the engagement of morphology to design, but also, intuition and ethics to space syntax. Furthermore, Hanson also highlighted the relevance in studying morphology at an early stage of the briefing, which provides a significant contribution to architecture, both to the practice but also within the academia:

*‘[...] the potential for space syntax to guide the relation between morphology and design at the briefing stage, when the limits of architectural possibility need to be set against the constraints of the unique design context, may represent its most vital contribution yet to architectural knowledge and also to present its strongest claim to be a legitimate academic discipline within the modern university.’* (Hanson, 2001, p.17)

Presently, this approach, linking spatial morphology to The social logic of space (Hillier and Hanson, 1984), conveys information to a widespread number of study fields, from the urban scale to the dwelling, which largely demonstrates the wide framework of approaches on space syntax research and the current extensive community of researchers, that can also contribute to a critical reflection upon its fundamentals.

Ultimately, by acknowledging that the development of space syntax has been instigated by the questioning of the spatial structures in the 1970s, which also engaged other researchers at that time with different approaches to this subject (Hillier and Hanson, 1997), a contemporary, renewed and entangled research culture might capture that ambiance for a more comprehensive study of the man-environment paradigm:

*‘Space syntax originated in the early seventies in an effort to understand why, from a spatial point of view, buildings and built environments were as they were, and occupied only a small corner of the theoretically vast field of architectural and urban possibility. From the earliest days we focussed on the study of real cases, and our efforts could be contrasted with the parallel efforts of others such as March and Steadman at Cambridge (and then at the Open University) to identify the formal and geometric limits of architectural possibility. They studied possibility, we studied actuality, and we compared notes in the friendly rivalry of a mobile joint seminar, which soon expanded to include George Stiny, Bill Mitchell and others. The earliest space syntax work took real environments, such as organic settlements, and vernacular buildings, and tried to identify the formal, spatial and functional forces that generated their characteristic spatial forms.’* (Hillier and Hanson, 1997, p.1)

## REFERENCES

- Architectural Research and Teaching (1970a), *Architectural Research and Teaching*, 1(1).
- Architectural Research and Teaching (1970b), *Architectural Research and Teaching*, 1(2).
- Architectural Research and Teaching (1971), *Architectural Research and Teaching*, 1(3).
- Banham, R. (1960), 1960: Stocktaking. In *Architectural Review*, 127(756), 93-100.
- Coelho, C. and Krüger, M. J. (2015), 'Towards a methodology to assess adaptability in educational spaces: An entropy approach to space syntax'. In: K. Karimi, K., Vaughan, L., Sailer, K., Palaiologou, G. and Bolton, T. (Eds.). *Proceedings of the 10th International Space Syntax Symposium*, London, UK: Space Syntax Laboratory, The Bartlett School of Architecture, University College London, p.17: 1-20.
- Cowan, P. and Watson, N. (1961), 'Opinion: some personal views on architectural education?'. In *The Architects' Journal*, 133(3448), May 18, p.744-746.
- Hanson, J. (2001), 'Morphology and Design. Reconciling intellect, intuition, and ethics in the reflective practice of architecture'. In: Peponis, J.; Wineman, J.; Bafna, S. (Eds.). *Proceedings of the Third International Space Syntax Symposium*. Atlanta, U.S.A: Georgia Institute of Technology, p.06: 1-18.
- Hillier, B and Leaman, A. (1975), 'The architecture of architecture. Foundations of a mathematical theory of artificial space'. In: Hawkes, D. (Ed.) (1975). *Models and Systems in Architecture and Building. LUBFS Conference Proceedings Number 2*, p.5-28. Second Conference of the Centre for Land Use and Built Form Studies, September 1973. University of Cambridge, Department of Architecture. The Martin Centre for Architectural and Urban Studies, Lancaster: The Construction Press.
- Hillier, B. (1970), 'Psychology and the subject matter of architectural research'. In: Canter, D. V., University of Strathclyde and Royal Institute of British Architects. *Architectural psychology: Proceedings of the conference held at Dalandhui*, University of Strathclyde, 28 February-2 March 1969, London: RIBA, p.25-29.
- Hillier, B. (1972), 'Architectural and engineering in environmental education'. In *Journal of Architectural Research*, 2 / 2, November, p.111-118.
- Hillier, B. (1996). *Space is the machine: A configurational theory of architecture*. Cambridge: Cambridge University Press.
- Hillier, B. and Hanson, J. (1984), *The social logic of space*, Cambridge: Cambridge University Press.
- Hillier, B. and Hanson, J. (1997), 'The Reasoning Art: or, the Need for an Analytical Theory of Architecture'. In: Major, M. D. and Amorim, L. and Dufaux, D. (eds.), *Proceedings of the First International Space Syntax Symposium*, London: University College London, p.01: 1-5.
- Hillier, B. and Leaman, A. (1973), 'The man-environment paradigm and its paradoxes'. In *Architectural Design*, Vol. 43(8), p.507-511.
- Hillier, B. and Leaman, A. (1974). 'How is design possible?'. In *Journal of Architectural Research*, 3(1), 4-11.
- Hillier, B., Burdett, R., Peponis, J. and Penn, A. (1987), 'Creating Life: or, does architecture determine anything?'. In *Architecture and Behaviour*, Vol. 3, No. 3, p.233-250.
- Hillier, B., Hanson, J. Peponis, J., Hudson, J. and Burdett, R. (1983), 'Space syntax: a different urban perspective'. In *The Architects' Journal*, (1983) 30 November.
- Hillier, B., Leaman, A., Stansall, P., Bedford, M. (1976), 'Space Syntax'. In *Environment and Planning B*, 1976, volume 3, p.147-185.
- Hillier, B., Musgrove, J., O'Sullivan, P. (1972), 'Knowledge and Design'. In: Environmental Design Research Association, Mitchell, W., Aia-Architect-Researchers' Conference (1972), *Environmental design: research and practice: Proceedings of the Third Conference of the Environmental Design Research Association*, Los Angeles: University of California Press, p.29.3: 1-14.
- Hillier, B., Peponis, J., and Simpson, J. (1982), 'National gallery schemes analysed'. In *The Architects' Journal*, 176(43), 38-40.
- Llewelyn-Davies, R. (1952), Men of the year: Richard Llewelyn-Davies. In *The Architects' Journal*, 115(2968), 97-105.
- Llewelyn-Davies, R. (1957), 'Deeper knowledge: better design'. In *Architects' Journal*. May 23, 125(3247), p.769-772.
- Llewelyn-Davies, R. (1960), 'Human Sciences'. In *The Architectural Review*, 127(757), 188-190.

- Markus, T. (1972), *Building performance: report of the Building Performance Research Unit, School of Architecture, University of Strathclyde*, London: Applied Science Publishers.
- Martin, L. (1958), 'Conference on Architectural Education: held at Magdalen College, Oxford, 11, 12 and 13 April: Report by Professor Sir Leslie Martin, M.A., Ph. D'. In *The Journal of the Royal Institute of British Architects*. Third Series, Vol 65, 8, June, p.279-282.
- Musgrove, J., and Doidge, C. (1970), 'Room classification'. In *Architectural Research and Teaching*, 1(1), p.31-36.
- Netto, V. (2015), 'Reflections on space syntax as sociospatial theory'. In: K. Karimi, K., Vaughan, L., Sailer, K., Palaiologou, G. and Bolton, T. (Eds.). *Proceedings of the 10th International Space Syntax Symposium*, London, UK: Space Syntax Laboratory, The Bartlett School of Architecture, University College London, p.111: 1-11.
- O'Sullivan, P., Territt, C., Musgrove, J., Hillier, B., and Leaman, A. (1975), 'Architectural research: problems of organization and funding in the United Kingdom'. In *Journal of Architectural Research*, 4(2), p.41-46.
- Piaget, J. (1971), *Biology and knowledge: An essay on the relations between organic regulations and cognitive processes*, Edinburgh: Edinburgh U.P.
- Popper, K. R. (1962), *Conjectures and refutations: The growth of scientific knowledge*, New York: Basic Books.
- Royal Institute of British Architects (1969), 'The Department of Architectural Education'. In *The Journal of the Royal Institute of British Architects*, Inside the RIBA, October 1969, Volume 76, Number 10, p.424-426.
- Snow, C. P. (1959), *The two cultures and the scientific revolution*, The Rede Lecture Series. London, New York: Cambridge University Press.
- The Architects' Journal (1952), 'Men of the year: Richard Llewelyn-Davies'. In *The Architects' Journal*, 115(2968), 97-105.
- The Architects' Journal (1972), 'RIBA election special'. In *The Architects' Journal*, 155(21), May 24, p.1120-1131.
- The Architects' Journal (1983), 'Mission Impossible?'. In *The Architects' Journal*, 179(51), 14-15.
- Unit for Architectural Studies (1968), *The Use of Space and Facilities in Universities. Report*, London: London University, University College, Bartlett School of Architecture.
- Weeks, J. (1964), 'Indeterminate Architecture'. In *Transactions of the Bartlett Society*, vol. 2, p.85-106.