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## Architecture and Language

### Morphosyntactic-Morphosemantic Relations and (Con)figuration

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#### ABSTRACT

Spatial configuration, a key concept in space syntax, is founded on an analogy of architecture with language, arguing that the cultural patterns of inhabitation are similar to linguistic rules we use in speaking and writing (Hillier, 1996). Yet, in spite of this analogy, space syntax seeks ‘descriptive autonomy’ with minimum linguistic intervention, deeming language an insufficient tool in analysis and design. As a result, the powers of language to organize our spatial experience stay outside the purview of space syntax, as does design, while the morphological synergies between architecture and language remain unexplored. This paper addresses the relationship of architecture and language through three main lines of inquiry. a. the significance of language in social life and design; b. an analysis of the hermeneutic system proposed by Hillier and Hanson in *The Social Logic of Space* (1984), forming the structure of interpretive concepts used in space syntax research; c. the ontological distinction between object and substance (Gibson, 1971), explaining where categories of analysis derive from in order to expand space syntax from an analytic theory to a theory of design; d. an analysis of examples using the analogy of architecture with figurative language as a tool. Building on Hjelmslev’s (1943) theory of language, the paper argues that like all systems organizing content, the ‘non-discursive technique’ (Hillier, *ibid.*) rests on both *morphosyntactic* and *morphosemantic* relations. Buildings and cities constitute not only the socio-spatial, but also the conceptual, discursive and semantic fabric of society.

#### KEYWORDS

Configuration, Architecture, Language, Syntax, Semantics, Morphosyntactic, Morphosemantic

#### 1 INTRODUCTION

*‘In all matters, but particularly in architecture, there are these two points: - the thing signified, and that which gives it significance. That which is signified is the subject of which we may be speaking; and that which gives significance is a demonstration of*



*scientific principles. It appears, then, that one who professes himself an architect should be well versed in both directions'. Vitruvius, Book I*

In *Space is the Machine*, Bill Hillier (1996) sets out an analytic theory of architecture based on the notion of configuration. Configuration is defined as relations of things to other things resting on a theoretical analogy of architecture with language. The spatial properties defining the cultural inhabitation of space are similar to linguistic rules we use in speaking and writing, or the unconscious mechanisms we 'think with'. In architecture, configuration is raised from non-discursive knowledge to discursive comparative thought, aiming at innovation (ibid.). For Hillier, an analytic theory is 'the necessary corollary of architectural autonomy and creative innovation', offering protection from 'externally imposed restrictions that substitute ideology for architectural creativity' (ibid.: 40). In spite of the analogy of architecture with language, space syntax opts for descriptive autonomy by minimum linguistic intervention. The purpose is to make architecture 'speak' instead of speaking on its behalf. As a result, the question of whether the morphology of language is a useful tool for architectural morphology remains largely unexplored. As to architectural creativity, this remains outside the purview of space syntax some fifty years since its development, severing its connection with design theory and practice.

These shortages are due to some epistemological and methodological difficulties. One such difficulty arises because space syntax aligns with the scientific paradigm of knowledge, privileging the verifiable character of analysis over the value-laden and propositional nature of design (Psarra et al, 2018). Second, it foregrounds the configurational structure of built space rather than the conceptual ordering of space (ibid.). Third, the method is used to test the functional performance of built spaces and designs rather than contribute to design generation and invention. By placing emphasis on instrumental ends, space syntax implies a definition of society, institutions and artefacts as purely utilitarian and practical as opposed to cultural and symbolic, which was not intended by the original theory and its founders (ibid.). However, even a simple look at one of its foundational texts, Hillier and Hanson's, *The Social Logic of Space* (1984), confirms that from simple analytical concepts to complex theoretical ideas, socio-spatial relationships are described using a 'lexicon' of spatial units (convex spaces, axial lines), a syntax (relations), and a system of categories carrying social content (labels). Spatial properties are regarded as embodying their own configurational significance, but the ways in which they become meaningful is by corresponding categories of social, institutional and professional relations. These categories are not only spatially and socially formatted, but also conceptually and semantically defined.

*Is minimum linguistic intervention sufficient in capturing spatial and social relations? Is space syntax free of linguistic and semantic strategies of description, classification and interpretation? How can linguistic conceptual and semantic models complement spatial models in analytic description and design?*



I will address these questions through four kinds of inquiry: a. the significance of language in social life and design; b. an analysis of the ‘interpretative framework’ (1984: 94) proposed in *The Social Logic of Space*, i.e. the overarching structure the authors use to define space and meaning; c. the ontological distinction between object-like and substance-like categories (Gibson, 1971), defining where categories of analysis can derive from in order to expand space syntax from an analytic theory to a theory of design; d. an analysis of examples using the analogy of architecture with figurative language. The purpose of the study is two-fold: to expand the conceptual apparatus that determines and limits space syntax in terms of how we understand architecture as rule-based activity; to discuss the conceptual and syntactic logic of artefacts, which lend themselves well to both analytic description and design formulation. Building on Hjelmslev’s (1947) theory of language, I argue that like all systems organizing content, the ‘non-discursive technique’ (Hillier, *ibid.*) rests on morphosyntactic and morphosemantic relations. Non-discursive descriptions of configuration alone have constrained space syntax thought from engaging buildings and cities not only as the socio-spatial, but also the conceptual, discursive and semantic fabric of society.

## 2 WHY LANGUAGE MATTERS

### 2.1 The *interactive* relationship of architecture with language

Like every social practice, architecture has a verbal component, since language provides us our primary means of communication. Language is vital to architects constituting a significant part of what they do. Their effectiveness in gaining commissions depends upon their verbal skills of persuasion; how they use language and visual media to conceptualise and communicate their ideas; the ways they employ linguistic resources and classificatory schemes, codifying and transmitting professional knowledge in precise detail (Markus & Cameron, 2002). A specific example of a linguistic resource is the design brief, providing functional categories and quantities by labelling, classifying and producing taxonomies. Learning a professional language and using ordinary language effectively are thus, inseparable from mastering the craft of architecture as a whole (*ibid.*).

Language is not only about specialized or lay terminologies used in architectural production. It is in itself a form of social practice, implicated in the production and reproduction of attitudes and values in society, including attempts to change the nature of these attitudes through policy and design (*ibid.*). The social systems of classification are determined by cultural ideologies defining boundaries between social categories. These boundaries are manifested spatially, and this is especially clear in the context of institutions which utilize architecture as a disciplinary medium, embedding aspects of power, control and knowledge through spatial practices (Foucault, 1973). The taxonomies that are most salient in buildings and briefing documents are classifications of spaces, functions and people, showing that such classifications are not neutral, but socially situated. The brief for William Stark’s Lunatic Asylum in Glasgow (1807) for example, was



essentially a socio-medical taxonomy of the inmates categorised by gender, social class and diagnosis, a taxonomy that is reflected in the spatial organisation in the building (Markus & Cameron, *ibid.*). In the case of institutions such as hospitals, libraries, museums, scientific laboratories and so on the interactive relationship of architecture with language is embodied in the spatial arrangement of these institutions, using taxonomies that are recorded in texts, labels, catalogues and inventories, and reflecting the social construction of knowledge (medical, informational, artistic, theoretical, scientific). This interactive relationship is generally known as *pragmatics*, defining the linguistic and social context in which architecture arises (Eco 1995, Markus and Cameron, *ibid.*).

## 2.2 The *cognitive* relationship

Like all systems of knowledge, language is a source of thought and meaning in its own right. Language organizes categorizes and classifies reality (Eco, 1995), shaping the environment and our responses to it. One of the fundamental ways in which language does this is through *displaced reference*, ordering spaces, objects and experiences that are not present in one's sensual field, and communicating things that are remote. For example, one can describe the arrangement of furniture in a room, and make it possible for others to understand the description without the need to be present in the same space. Noam Chomsky uses the phrase 'John's book is in every bookshop in the country' to demonstrate the unique capacity of human language to be both abstract and concrete. John's book is a particular instance of a book. The printed copies of John's book form a general category of objects, distributed in many book shops. In the first case, a particular is identified by the spatial region of a desk, a shelf or a library. John's book in every bookshop on the other hand, refers to a class of entities that are not spatially integrated in a single location.

The capacity of language to designate particulars and universals through displaced reference drives the distinction between transpatial and spatial entities in *The Social Logic of Space* (*ibid.*). For Hillier and Hanson, this distinction derives from the ways in which space makes its appearance in language. A transpatial class is a conceptual category independently of spatial realization. It is a collection – for example, medical staff and patients in a hospital, teachers and students in a school - summed into composite entities 'without regard for spatio-temporal indicability of location' (*ibid.*, 40), although they can coincide with a spatial grouping. A spatial entity on the other hand, depends on some property of spatial integration, that is, on its being identifiable through a spatial rule with a specific location. Architecture is not a linguistic phenomenon, but alongside drawings and other types of documentation, it relies on language, particularly during design generation where elements and relationships are named, categorized, ordered and invoked in *absentia*. Linguistic categories and conceptual relationships feature not only in the organizational strategies of design but also in how we talk (and write) about architecture. Here I refer to Adrian Forty's suggestion that architecture is a three-part system: the building, its image (photographs or drawings) and its accompanying critical discourse (by the architect, client or critic). As Forty explains, even if architecture is not a language, this does not lessen the value of language for understanding architecture (*ibid.*). On the contrary, since



its emergence as a liberal art and its separation from the mechanical arts in the fifteenth and sixteenth centuries, architecture has developed along an epistemological tradition which is discursive, building knowledge not only through space but also through language.

### 2.3 The *analogical* and *figurative* relationship

The aforementioned considerations refer to the *interactive* and *cognitive* relationship between architecture and language. An *analogical* relationship also exists which has been crucial to architects and theorists since the seventeenth century. The use of language analogy in architectural discourse had a series of purposes: to account for the part-whole relationships, seeing elements that make up a building as words that make up a text; to characterize style in architecture as much as a property of architecture as of poetry; to describe the historical origin of architecture, which like language was a development of the human faculties; to discuss architecture as a medium of communication, seeing works of architecture as texts and architecture as vernacular language; and to compare buildings to books or narratives (Forty, *ibid.*). Some characteristic examples of the linguistic analogy are Quatremère de Quincy's likening of historical monuments to libraries as public inscriptions or records of the people; Gottfried Semper's theory linking artistic inquiry with linguistic theory; and John Ruskin's and William Morris' remarks that buildings and all living arts are telling stories (*ibid.*).

The language analogy came under strong criticism by modernism in the twentieth century, asserting that buildings were to be read as autonomous works. Writing on the occasion of the Museum of Modern Art's fifth anniversary (1934) Alfred Barr, Jr., MoMA's founding director, set up a dichotomy between an intellectual understanding of art mediated by words and a direct experience of art based on the unmediated encounter between the viewer and the object. 'Words about art may help to explain techniques, remove prejudices, clarify relationships, suggest sequences, and attack habitual resentments through the back door of intelligence.' But the front door of understanding is through experience of the work of art itself' (Barr, 1934). Although art was not to be read through words, Barr used word-like entities to construct classifications and a narrative of modern art based on two currents - a classical and romantic one - strung together in sequence through a series of room chapters (Elderfield, 2004; Psarra 2009).

Architecture was also affected by a longstanding assumption that 'experiences mediated through the senses are fundamentally incompatible with those mediated through language' (Forty, *ibid.*: 12). Hillier and Hanson (1984) defined architecture as *morphic language*, a system where meaning arises out of the pattern itself or its syntax, rather than extraneous associations of architecture with natural language, or a 'misconceived semiology' (1989). Hillier described this analogy as a *weak one* (1989), as opposed to the *strong analogy* adopted by structuralism and semiotics, where architecture was thought to be homologous to language, or otherwise that architecture *is* language. The most characteristic expression of the weak analogy is the notion of configuration, defined as a structural condition in which a local change affects a pattern as a



whole. This resonates with Saussure's (1916) understanding of language as a system of differences in its capacity to make distinctions between one thing and another. 'Language does not offer itself as a set of pre-delimited signs that need to be studied only in terms of their meaning and arrangement. On the contrary, language is a system of inter-dependent terms in which the value of each term results solely from the simultaneous presence of the others' (Hillier, *ibid.*: 2).

However, relationships in language concern not simply sequential operations between noun and verb apparent in a sentence (syntagmatic relationships), but also laws of association which relate each word to other potential but not present words in the semantic field, as 'moon and stars' are in the semantic field of 'sun' (paradigmatic relationships). Work by Lakoff and Johnson (1980) has shown metaphors used in language are realisations of conceptual metaphorical mappings. Jakobson and Hale (1971) argued that metaphor and metonymy are the two basic axes of language and communication. Metaphor is a paradigmatic dimension based on substitution and similarity, while metonymy is a syntagmatic dimension based on contexture and contiguity. These dimensions define a key property of language, in encouraging one thing to be seen as another and stimulating a sense of uncertainty that lies at the basis of meaning. 'Language does not deal in directness, it deals in metaphor and ambiguity' (Forty, *ibid.* 38). If architecture has cognitive, interactive and analogical relationships with language at the level of syntax, semantics and pragmatics, to these relationships we should add the use of *figurative language* for rhetorical, compositional and design purposes, so that elements, their syntax and semantics can acquire multiple senses - as happens with metaphorical and metonymic mapping in thinking.

It is precisely the ability of language to thrive in ambiguity that makes it an unreliable medium for the quantitative precision and descriptive autonomy sought in space syntax. It is also the fact that space syntax pursues explanations through internal spatial relationships rather than social, economic and linguistic forces, semantic meanings, or conceptual patterns of making in design. In an analysis of space syntax conference publications, we showed how language used in this field can be represented by networks of concepts generated *a posteriori*, that is, where the abstractions are collectively and progressively developed and related to one another over time (Krenz et al, 2019). In the section that follows I explore *a priori* structures of this language as presented in *The Social Logic of Space* (*ibid.*), that is, initially formulated from theoretical deduction rather than empirical exploration.

### 3 DECODING *THE SOCIAL LOGIC OF SPACE*

In order to explore the language of concepts used in *The Social Logic of Space*, one needs a theoretical model. This will be provided by Louis Hjelmslev (1943). A natural language articulates meaning at two levels or planes which have a reciprocal relation: there is an expression plane called 'expression-form' and a plane of content called 'expression-content' (figure 1). Each of these planes can be subdivided into form, substance, and an unshaped continuum organized by language. For natural languages the expression-form consists of the



phonological system, the lexical repertoire and the rules of syntax. Expression-content on the other hand, represents the array of concepts we can express and their structure. Realizing through concrete utterances the possibilities provided by the expression-form, we produce expression substances like the words used in a text. In elaborating its expression-form a language selects, out of the continuum of sounds that the human voice can make, a particular subset of phonemes, and excludes other sounds which therefore, do not belong to that language (Eco, 1995).

In order for the sounds of speech to become meaningful, the words formed must have meanings associated with them. The content-continuum represents everything we can talk or think about, as the universe, the physical or mental reality to which our language refers. Each language however, organizes the way in which we talk or think about reality in its own particular way, through a content-form. Examples of the way in which the content-form shapes our world might be the arrangement of colours in a series from light to dark, or red to violet; the way we use notions such as genus, species and family to organize the animal kingdom; the way we use semantically opposed ideas, such as hot versus cold or singular and plural as systematically organised pairs. Examples of expression-content in architecture are the arrangement of space onto solids versus voids or boundaries versus space; the ordering of built structures into loads versus supports, or walls versus roofs. By ‘content-substance we mean the sense that we give to the utterances produced as instances of the expression substance’ (ibid.: 21).

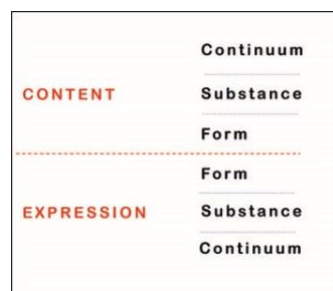


Figure 1

### 3.1 Generative Syntaxes

The mode of organizing content in *The Social Logic of Space* draws from early explorations into the so-called ‘generative syntaxes’ using manual or computer simulation (chapter two). These are ‘combinatorial systems governing the possibilities of forming rules’ (ibid.: 66) and providing ‘the foundations of the ideas used throughout the book’ (ibid.: 81). Generative syntaxes are organised into matrices along elementary bipolar concepts of ‘symmetry-asymmetry’ and ‘distributedness – non-distributedness’ (figure 2). Symmetry describes syntaxes formed by the outside of objects, while asymmetry captures cases where a single object or a series of objects contain others, creating hierarchical relationships among them. Distributedness accounts for syntaxes where the rules are distributed across objects, while non-distributedness concerns syntaxes that ‘are accomplished by means of a single cell [object] containing others rather than a collection’ (ibid.:





11). Described as ‘glued’ (symmetrical and distributed) and ‘bound together’ (asymmetrical and non-distributed), these syntaxes capture the two opposite poles in a spectrum of ‘restrictions in an otherwise random process’(ibid. 65), situated between relative randomness (local-to-global rules) and order (global-to-local).

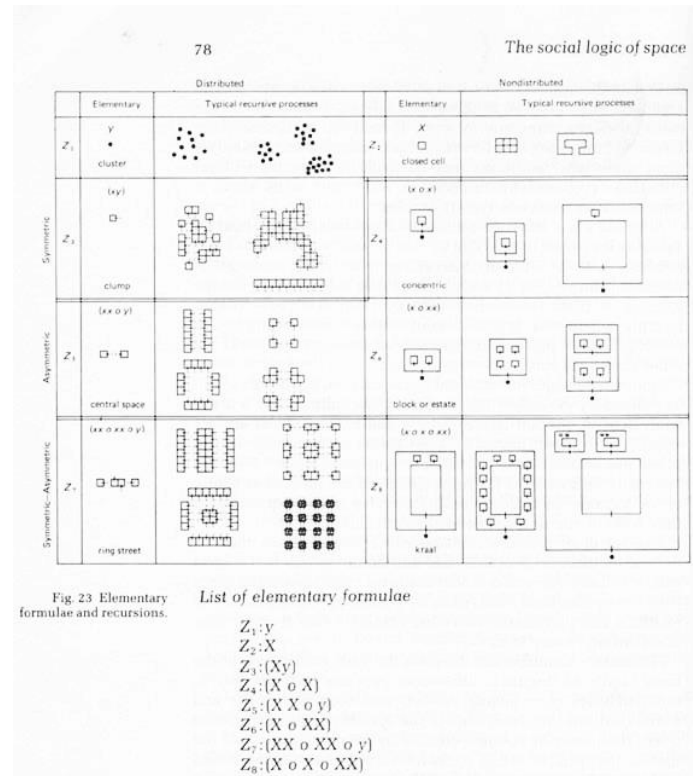


Figure 2 Generative Syntaxes, The Social Logic of Space (1984), p. 78.

These generative syntaxes are described using two systems of notations, ‘elementary formulae’ and an ‘ideography’, respectively (66). Elementary formulae are in essence tree-structured representations in parenthetical form (below the table in figure 2), routinely used in linguistics to explain sentence structures in language (Pinker, 2014). The ideography is a language of graphic symbols consisting of a two-dimensional geometry of rectangular objects and their recursions (figure 2). Using a vocabulary (symbols) and a syntax (rules) that governs relations of ‘a basic family of linguistic differences’ between ‘singular and plural subjects, objects and their relations’ (ibid.: 77), the generative syntaxes articulate Hjelmslev’s domain of expression-form for ‘the morphic language of space’ (ibid.: 66). However, as the authors explain, the generative syntaxes do not concern ‘purely mathematical enumeration of combinatorial structures... but real strategies that human beings have found useful in organizing effective space’ (ibid.: 72). For this purpose, entrances are added to the rectangular objects, modifying them to permeability complexes. The arrangements thus, acquire meanings associated not simply with their abstract mathematical syntax, but also with habitable space. In essence, the plane of expression-form (the generative syntaxes) is mapped onto the plane of expression-content (inhabitable space). In addition to entrances, the authors attach a second layer of expression-content to the generative syntaxes categorizing and naming real world cases, such as the ‘beady ring settlements’



and the traditional street patterns on one side of the matrix, social housing estates and the African settlement of Ambo Kraal on the other.

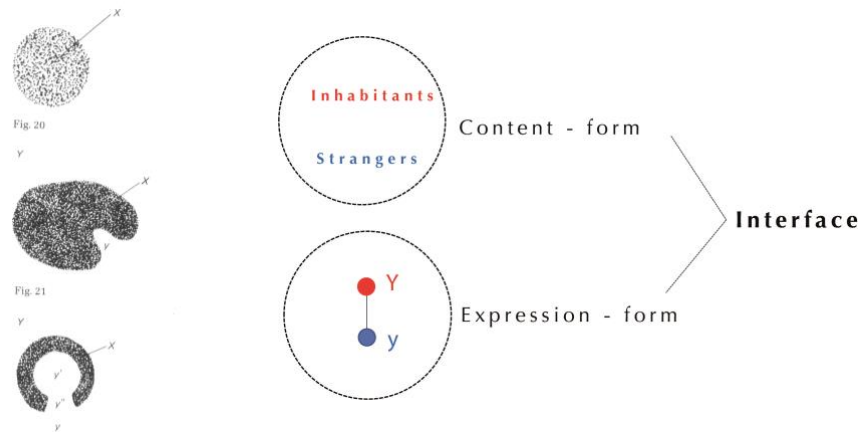


Figure 3A-B The simplest non-distributed structure (A), *The Social Logic of Space*, (1984), p. 75; translation of the simplest morphic unit into a semantic unit based on Hjelmslev's model (B).

### 3.2 The structure of the social theory of space – the makings of a hermeneutic system

The second type of description the authors use in the book - what became the standard mode of analysis in space syntax research – concerns discrete spatial representations (axial lines and convex spaces) and graph-analytic measures applied to real world environments. Morphological descriptions in this mode proceed through a series of 'postulates' constructing an 'interpretive framework' (ibid.: 94) of clear-cut correspondences between morphic units of space and social categories. For example, the building blocks in a settlement ('X') correspond to the domain of 'inhabitants', while the exterior of the settlement ('Y') and the continuous system of open space ('y') inside the settlement refer to the domain of 'strangers'. An elementary building ('x') establishes a difference between two categories of space, an interior and the exterior, 'interfacing' by analogy the transpatial entities of 'inhabitants' and 'visitors' (figure 3A-B). Inhabitants are those who control the knowledge in a building and its purposes, while visitors are those who enter the building but do not control it. The mapping of the elementary building onto the category of the inhabitant and the exterior space onto the stranger, defines the conceptual presence of the transpatial social class in the materialization of a formal spatial class. This mapping is comparable to the expression-form/content-form in language, where the syntax of the interior-exterior relationship becomes meaningful by being associated with the inhabitant-visitor relationship, carrying social content.

In the introduction, the authors explain that the elementary building and the notion of the interface form the foundation of how these initial ideas were developed into a social theory of space. This theory works through an expansion of the initial pair of inside–outside/inhabitant–visitor into other oppositions such as mechanical - organic solidarity, long models - short models, deterministic - probabilistic, strong - weak, shallow - deep, ideology - politics, stability - change, reproduction - production, local-to-global - global-to-local (figure 4A). A series of relationships among pairs of concepts is thus established by their appearance and repetition across different parts of the text, as a chain of connotations in which a term - for example space - is defined in opposition to another term - transpace - and each pair is aligned with a chain of other terms and attributes, each explaining and further articulating the initial duality of inside-outside. Depending

Inhabitants	Strangers
Tran-spatial	Spatial
Ideology	Politics
Discontinuous	Continuous
Long models	Short models
Conservative	Generative
Control	Generation
Deterministic	Probabilistic
Re-production	Production
Local	Global
Order	Structure
Asymmetry	Symmetry
Non-distributed	Distributed
Strong boundaries	Weak boundaries
Segregated	Integrated
Buildings	Settlements

Figure 4A Pairs of semantically opposed concepts in *The Social Logic of Space* (1984)

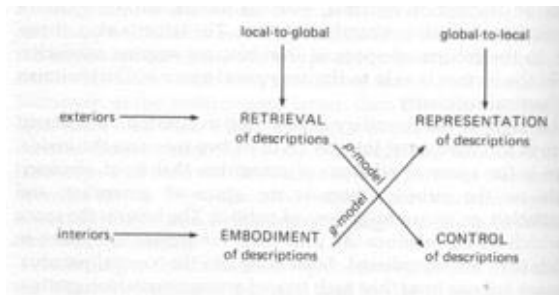
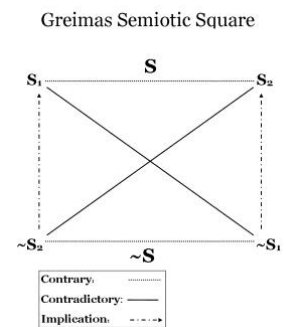


Figure 4B *The Social Logic of Space* (1984), p. 22

on context, there are two ways in which these pairs can refer to spatial and social systems. One way concerns the transpatial world of interiors, ‘mapping social ideology’ in the sense of a fixed system of social categories and power relations among groups, and the ‘spatial’ world of the exterior mapping transactional politics. A second duality follows from this distinction, reversing this system of mapping in the case of societies that create ideological landscapes through their exterior, and interior structures that work as ideological spaces (shrines and religious buildings) or headquarters of transpatial groups (guilds, corporations, etc.).

It is worth noting that Hillier used an additional series of bipolar concepts, such as significance and signification (1985, 2011), non-discursive and discursive (1996), conservative and generative (1996, 2005), foreground and background (Hillier et al, 2012; Hillier 2017) in other texts privileging significance or syntax over signification or semantics to assert the syntactic dimension in space syntax. However, the system of pairs organizing content in *The Social Logic of Space* relies not



simply on the syntactic domain - the plane of expression-form - but also the semantic realm of content-form as a structural system of repetitive analogies linking pairs into constellations of opposites. The organization of paired concepts into a diagram that looks like a Greimas' semiotic square (figure 4B) - a tool used in structuralism and semiotics to analyse the relationships between semiotic signs - further confirms the reliance on linguistic semiotic systems and analogical thought in a theory that unstresses signification and foregrounds significance. The analogical system in which a cell refers by analogy to the world of interiors (buildings), while the space directly connected to it concerns the world of exteriors (urban space), and its reverse, set out the *hermeneutic methodology* for space syntax research from then on, according to which configurational properties describing the interface between spatial and social categories are evaluated as belonging to one side of the elementary pairs or the other.

If this framework was developed under the influence of the structuralism of René Thom and Claude Lévi-Strauss, the evolution of space syntax since then shifted to empirical methods of studying space and social behaviour away from the systematic study of transpatial categories and signification. Yet the reliance on classification, linguistic labels assigned to spaces, objects, activities, people and the hermeneutic model built on the pair of expression-form/expression-content remained active in syntactic research. I do not argue that space syntax is a semiotic theory, but that it is not free from object-related categories of classification and linguistic-semantic processes of signification. These processes are largely unnoticed and under-researched alongside the theoretical, methodological, social, political and ideological values they embody and their effects, showing the persistence of what Hillier defined as 'ideas we think with'.

#### 4 OBJECT AND SUBSTANCE

By prioritizing how categories are spatially structured over how they are conceptually and semantically ordered, space syntax risks taking conceptual social structures as given, while also severing the link between analytical and generative approaches to architecture. One of the main reasons for this deficit is that any approach to conceptual order – whether this concerns physical or social relations - comes across the challenge of language. Built space as we experience it in everyday life does not easily fall into the ways in which entities are named and ordered into recognizable objects by human minds (Hillier, 2005). An environment can be described in two ways: first, through classes of denumerable objects of persistent size and shape, such as building blocks, walls, columns, openings, and second, as polymorphic space of arbitrarily many sizes and shapes. An approach that seeks to intersect configurational thought with conceptual and generative thinking needs to discover the basis for distinguishing 'objects' on the one hand, and 'substances' on the other.

J.J. Gibson uses the distinction between count nouns and mass nouns in English to explain the difference between objects and substances in the environment (1971). The former can be pluralized, the latter cannot, such as book and paper. We say a piece of paper but not a piece of



book. Objects can be counted but the operation of counting does not apply to substances. Yet, in visual perception, the distinction between denumerable objects and substances is not clear cut. Whenever we indicate some physical object, we necessarily indicate some sort of a substance as well; the reverse is also true. In an attempt to delimit these terms, Gibson uses the theory of surface layout underlying ecological optics. Surfaces without visible edges, are substances, not forms, or discrete units. Both substance and object have a surface with a visible texture and colour, but only an object has a persisting shape. The distinctive features of substance are its surface texture and its surface colour, but not its surface shape. 'It is not that substance is formless in some mysterious sense, but it is polymorphic' (ibid).

For Gibson, the general problem of how we perceive substances, objects and other interrelated features of the environment is a problem of experimental psychology. 'To solve it one has to bring into the laboratory and devise experimental methods for testing hypothesis' (ibid.). The absence of empirical research however, has not detracted architects, urban designers and scholars in the past 500 years from dissecting buildings and urban settings into elements, morphic and functional units, plots, blocks and ordering them into classes, canons, movements and styles, including relational systems such as classical orders, formal languages or building types. Classes are groups of entities that have similar qualities, meet the same requirements or 'satisfy some propositional function' (Russell, 1996: 20). As such, they are defined by group members and relationships of similarity and difference through which they form combinable logical structures. Hillier and Hanson's distinction between particular and universal terms mentioned previously define classes by membership into spatial and conceptual (transpatial) groups consisting of both elements and rules. However, as previously argued (Psarra et al, ibid.), transpatial information and its semantic dimensions remain secondary to spatial information in space syntax research, prioritizing how classes are spatially patterned over how they are conceptually organized.

## 5 MORPHOSYNTACTIC AND MORPHOSEMANTIC RELATIONSHIPS

Using Gibson's analogy with language, we can argue that like nouns, morphic units are recognized as entities that can be sorted, counted and ordered through membership groupings, such as a class of columns forming a colonnade; or superordinate classes, such as a base, *piano nobile* and roof, or subordinate classes, such as *entablature*, column and *stylobate*, in classical architectural language. Polymorphic space on the other hand, does not concretize into recognizable objects or classes of elements. In previous work (Psarra et al, ibid.) it was proposed that if a set of morphic units comprise a class, the range of their formal properties and combinations compose the form-of-a-class, while the set of configurational properties of these units construct the syntax-of-a-class. Put simply, the form-of-a-class concerns logical structures, while the syntax-of-a-class comprises spatial structures. It is important to stress that all relationships, including spatial configurational relationships are logical and conceptual. However, spatial relationships are understood through human empirical movement and occupation over time (Hanson 1989; Hillier, 1996; Psarra 2009). As such, they are different from conceptual

relationships specifying membership in classes, such as element ‘a’ is similar to element ‘b’ because ‘a’ and ‘b’ have the same shape, are located on the same side of an axis or made of similar material. The ‘form-of-a-class’ and the ‘syntax-of-a-class’ are not just sets of formal and configurational rules that govern the arrangement of forms in space and time. They also carry content about social structures, from organized activities to political beliefs and ideological patterns. We could thus, adapt Hjelmslev’s model (figure 5) by expanding the category of expression-form to comprise the form-of-a-class and the syntax-of-a-class, and the category of content-form to encompass content associated with both types of properties. From now on we will call the expression-form category the morphosyntactic category of relationships - encapsulating both form and syntax- and the content-form category as organising properties that are morphosemantic.

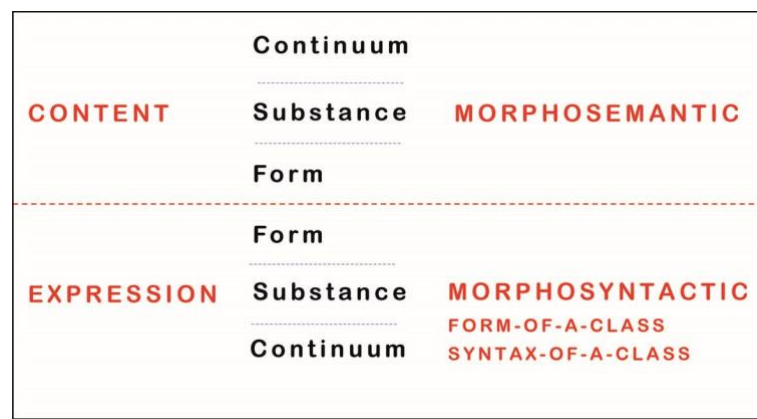


Figure 5

We can attempt to explain these two planes of properties using the example of Venice, a city which based on its morphological make-up can elucidate the two types of relationships. Venice is a characteristic example of an urban environment that comprises recognisable classes of elements, consisting first and foremost of a class of islands and one of canals. Each of the islands is made up of a class of ordinary buildings, a class of pedestrian alleys, one or two squares, one or two churches and one or more distinguished structures such as a Palazzo or a civic building. Depending on their position in the urban fabric, the alleys subdivide into further classifications, each with their own term, as reflected in Venetian toponymy (*fondamenta, salizada, calle, ruga* etc.). Further, the majority of the squares are defined by a similar composition of urban elements that repeats throughout the city: a church with its accompanying bell tower; a palace with dual access from a canal and the square or an alley; everyday buildings delineating the square along one, two or three sides; flights of steps that link the square with the water; one or more bridges joining the square with the neighbouring islands; and one or more wellheads or pieces of public art. The squares of Venice belong to the same conceptual class, by virtue of having common characteristics as volumetric voids of accessible public space in the densely-built fabric of each island, as do the churches, the palaces, the bridges, the alleys, the wellheads, and so on. These emerging classes are transpatial, consisting of elements and relations without regard of spatial indicability or relation to other spaces or to each other. As the majority of the squares are placed

at the intersection of the pedestrian and the canal networks and in proximity to elements of high syntactic values (Psarra, 2018), they are characterized both by consistent conceptual rules of membership, and consistent rules of configuration that embed them into the network as a whole (figure 6A-B). Through their repetition in identical membership in all islands, the squares and their elements form a composite codified language of recurring structures. We call this set of composite structures the form-of-a-class. The syntax-of-a-class which concerns the syntactic rules of configuration, spatially integrates the class of elements into a configurational structure, providing each square with a local and global description (Psarra et al, *ibid.*).

The two types of consistency reflect the organization and governance of the Venetian society as Venice developed over time. The form-of-the-squares expresses the complex set of social institutions in the islands, their materializations in built structures, such as the church, the patriciate class (palace), a social mix of population (everyday buildings) and social practices of community service, congregation, water collection and so on. The syntax-of-the-squares on the other hand, articulates the collective formation of the Venice out of island communities and institutions, forming interconnected centralities that organise the city and society as a whole.

The social boundaries which the morphosyntactic properties of the squares encoded in the past can be deciphered by an approach based not only on the binary of a single square versus the entire class of squares, but also according to their position in a series. Between a square in the fringes of Venice, the squares in adjoining islands and the Piazza San Marco at the centre of integration, the form-of-a-class comes in an ordered pattern of repetition. Between Monday and Sunday, spatial practices performed in the squares were also patterned. Then there was the

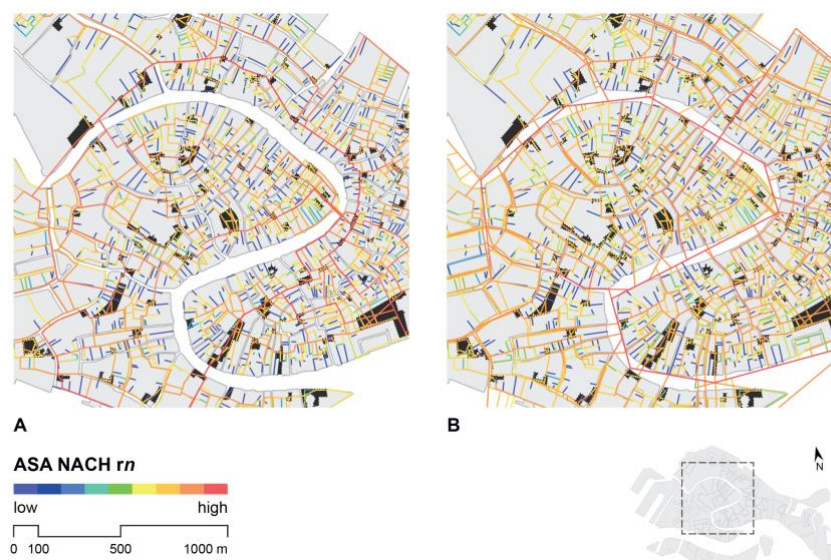


Figure 6A-B Squares and Churches in Venice (top); pedestrian network (NACH rn, A); pedestrian and canal networks joined (NACH rn) (B).

sequence of holidays and feast days through the year where activities ebbed and flowed between





neighbourhoods and the major civic spaces, spreading into wider orbits. In other words, the squares and the classes of elements they consist of must be seen not only in their syntagmatic relations of adjacency of one element to another in the local context of a single square, but also in their conceptual paradigmatic relations to other squares not immediately available to direct observation. Each unit in a square metonymically figures the square it sits in, the structure of other squares and that of the grandest square, the Piazza, an accentuated version of all squares. If this restrictive patterning based on a codified language of repetition defines the conceptual rules of the form-of-the-squares, the syntax-of-the-squares further patterns the class of squares with spatial relationships. Essentially, if squares did not have this consistent pattern of distribution, they would still form a conceptual class, but would have not been embedded as a whole into the spatial network. The perspective invested by these repetitive analogies and consistent distribution in the network invests the individual square with additional meaning. It also allows interpretation on the basis of a more fine-tuned structure of relationships, which the binary opposites (e.g. spatial and transpatial) cannot capture (Douglas, 1972). A square stays in the class of squares only insofar as it carries this consistent structure which allows the part to recall the whole, both spatially and conceptually.

We can use a second example, taking a close look at canals, buildings, bridges and connecting paths between islands in Venice (Figure 7). To understand how these elements are structured in classes we introduce a notional city block, as the elementary area surrounded by streets defining a ring-shaped path in the pedestrian network. Ring-shaped paths and the blocks in Venice connect islands by permeating the urban fabric either at great depth or tangentially next to water. The perimeter of the blocks is in its most parts constituted by the following: a. only building fronts; b. building and quayside fronts; c. only quayside fronts creating pedestrian paths (*fondamenta*) along quays fronting canals on either side. The underlying rule in Venice is that blocks straddle islands or that islands and blocks overlap (figure 7A-E). In contrast, the city of Amsterdam in the Netherlands has a different structure, where the ring-shaped paths around blocks never intersect with islands (figure 7F). In Venice the syntax-of-blocks (the ring-shaped path) is always the same while the form-of-blocks differs. In Amsterdam the two domains of relations are always the same. Following Gibson, we may suggest that this lack of consistency between the two domains of relations in Venice contributes to disorientation, as it is not possible to perceive islands and blocks as objects with clearly distinguishable visible edges. Objects and substances overlap in our perception.



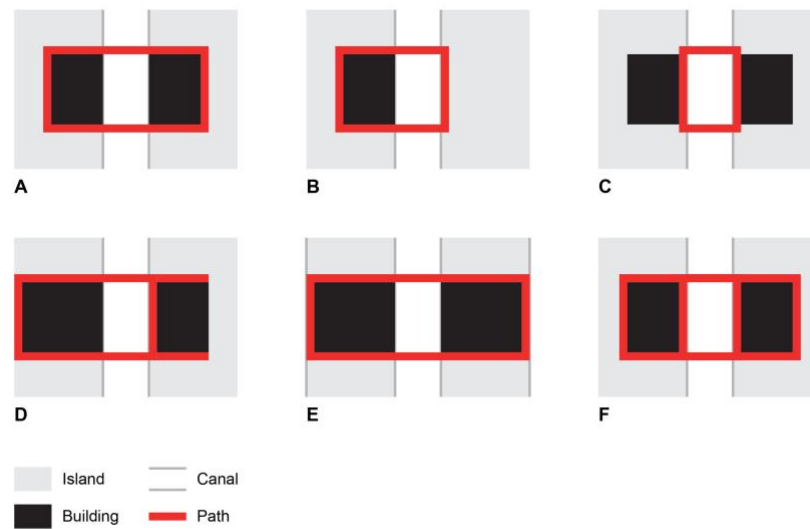


Figure 7A-F Patterns of notional blocks in canals and alleys in Venice (A-E) and Amsterdam (F)

## 6 INTENTIONAL AND EXTENSIONAL MODES

We demonstrated that rules in the domain of form can correspond to rules in the domain of syntax as in the squares of Venice and the blocks in Amsterdam, or partially overlap as in the case of blocks in Venice. We have argued elsewhere that the two domains of rules can be related through a bisociative process (Psarra et al, *ibid.*). Bisociation is a term introduced by Arthur Koestler to explain how creative acts always operate in ‘self-consistent but habitually incompatible frames of reference’ (1964, 35). If we consider relationships in each domain as a matrix and relationships across domains as rules of bisociation of these matrices, it is possible to identify two types of bisociation. The first one is where rules are applied to the same class of elements across a range of different rule domains (form, syntax, materials, activities, furniture etc.) as in the rule relating the same matrix of urban elements in each square with the rules describing the configurational syntax of all squares. The second type of bisociation concerns a case, where rules across domains are applied to different elements within each domain, creating a partial overlap between them, as in the case of blocks straddling islands. Let us call the first mode *intentional* and the second one *extensional* type of bisociation, borrowing the concepts of *intention* and *extension* of a class from logic (Russell 1914; Carnap 1971). Intention gives meaning to a term specifying the necessary conditions and properties for the term to express a class of objects. Extension on the other hand, specifies every object that belongs to a class as a way of giving meaning to a term. In short, intention emphasises properties that elements must have in order to be part of a class, whereas extension the members that fall under the definition of a class.



In the intentional mode, the amplification resulting from relations that apply to elements across domains highlights these relations and raises them to the level of consciousness. In the extensional mode, certain elements and rules have overlapping memberships in different domains and hence establish tension between domains. Drawing attention to the same property governing across different domains, from the typological and the figurative (e.g. palace, church, tower and associated symbols in Venice) to the syntactic (e.g. configurational centrality of the squares), from the natural (water) to the artificial (canal, wellhead, steps), and from the functional (bridge) to the symbolic (bridge as social tie) domain, the intentional mode of bisociation accentuates the morphosemantic over the morphosyntactic plane of relationships. In contrast, the extensional mode stresses the morphosyntactic plane, creating meaning out of assemblages of elements and relationships. The two modes are akin to Sakellaridou's analysis of Botta's architecture (2011), my own analysis of Botta's and Le Corbusier's houses (1997), and Hillier's (2011) description of two pathways of systematic intent in architecture. The first is where 'possibilities of building shape and figuring are used in such a way as to support each other, so that each confirms the effect of the other', and the 'different layers of form saying the same thing'. The second is where 'the different layers are used in different direction, so that tensions are created between the different layers of form' (Hillier, *ibid*: 148).

## 7 SOME EXAMPLES

I will read a number of buildings in terms of morphosyntactic principles and follow their operation in the morphosemantic domain. I should clarify that the morphosemantic category is a much broader category wide enough to allow for elements, spaces, forms, materials to operate directly, or to include conceptual categories that are absent from a particular space, but whose existence can be activated by historical reference, memory or simply the imagination. The analysis of the following examples is neither exhaustive nor it aims at discussing all possible meanings associated with a design. The purpose is to expand the thought range, rather than provide a method of analysis, acknowledging that the aesthetic resists systematic description and categorisation.

*Olivetti Showroom, Venice; Castelvechio, Verona; Canova Extension, Posagno (Carlo Scarpa)* (figure 8A-C). The initial intention of the adaptation of the corner shop in the Piazza San Marco, or the new space versus the old, defines the rules of spatial ordering. The morphosyntactic properties, i.e. the synchronic views travelling along the entire length of the showroom alongside the sinuous process of the viewer through the interior (the syntax-of-a-class); the linear and vertical slicing of space; the ways in which the sculptural staircase, the water and the glass mosaics are inserted in the narrow spatial zones (the-form-of-a-class) become morphosemantic relations. They refer to Venice metaphorically in two ways: first, as a catalogue of urban

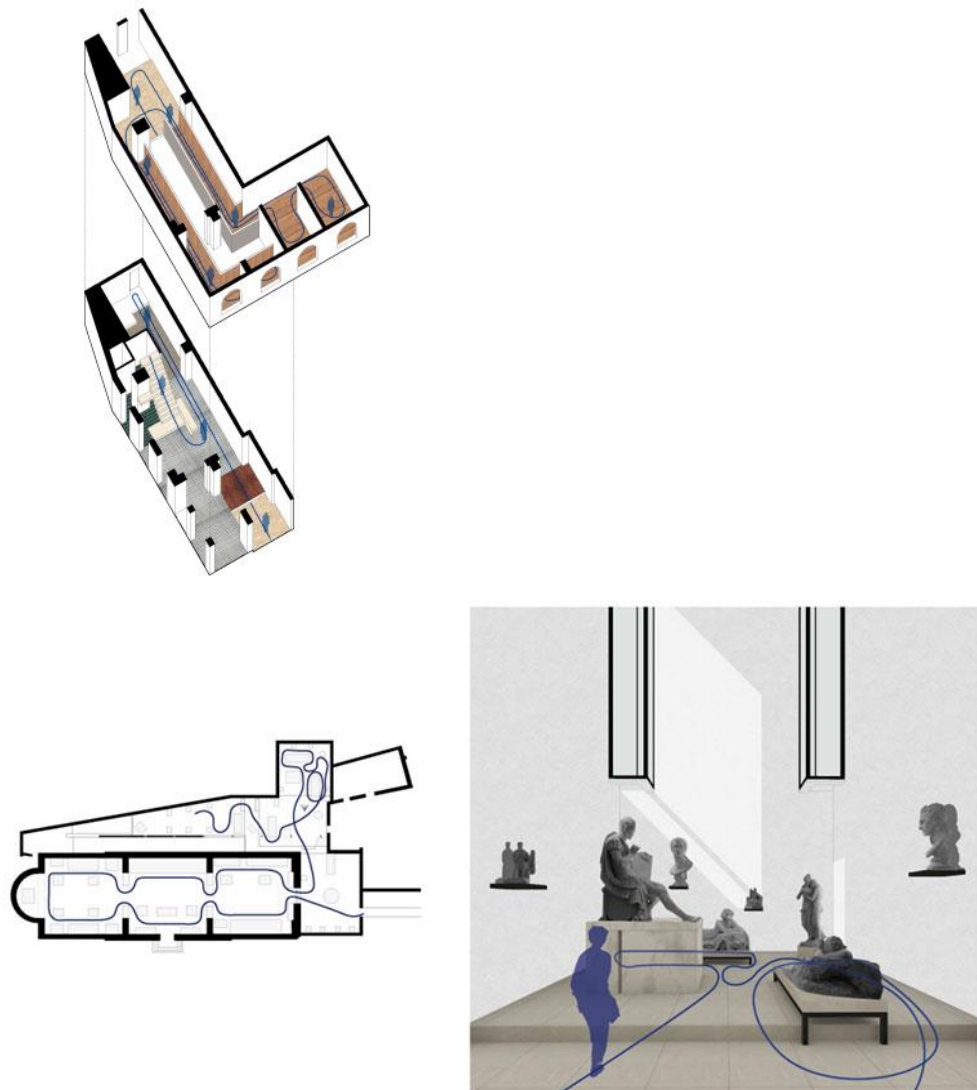


Figure 8A-C Clockwise: Olivetti Showroom (A); Canova Museum Extension, plan (B); interior perspective (C). Carlo Scarpa.

elements and forms (classes), i.e. narrow alleys, fondamentas, sottoporticos, bridges stretching over the water, water flooding the edges of spaces, colourful materials and rich surface decorations; and second, as urban elements in a morphosyntax, consisting of vistas and pathways, the former extending over the linear stretches of the canals, to link places; the latter indirectly reaching these places, by the meandering and intersecting canals and alleys (Psarra, 2021).

Staging movement through a long sequence is a device frequently used by Scarpa even when spaces are not linearly shaped, as in the extension to Canova's Museum in Possagno (figure 8B-C) and the Castelvechio in Verona, where the varied positioning of statues of different size and height requires the visitors to walk around them crossing their own paths multiple times. The Castelvechio moves the visitor through a single space three times, referring to Venice's promenades, shifting floor planes, countless steps, stairs and loggias, while the pond at the front of the building recalls the way in which Venice doubles images in the reflections of its canals. We could say that the rules of synchronic vision and perambulating paths – essentially an interplay between visibility and permeability – transforms

itself into a morphosemantic rule signifying Venice's spatial structure. The interface between old and new, water and surfaces, and between materials themselves asserts Venice as a palimpsestic evolutionary context (Psarra, *ibid.*).

Another analogical motif used by Scarpa in the extension to Canova's Museum is *mise-en-byme*, which means placing a copy of an image or object inside itself. The glass cabinets containing figurines metonymically refer to the prismatic windows at the corners of the tall space, metonymic being a term that describes the capacity of a fragment to express the whole (a syntagmatic relation). They thus, function as mini galleries inside the larger gallery, linking the scale of the building as a whole to that of the windows and the displays (figure 8D). Scarpa's work has been interpreted as being about a metonymic articulation of found fragments, spoils of the constructed world, a tradition based on the Venetian ability to reconcile discrete building elements of disparate origin. Venetians built most of their city using building spoils that came from their trading routes in the eastern Mediterranean. A clear example of a built structure made of found elements is the façade of San Sebastiano in Venice. The upper columns are shorter than those on the ground floor and raised on pedestals so that the two floors can have matching heights (Frascari, 2004). This is because the columns on the upper level were found objects that came from another structure (Psarra, *ibid.*).



Figure 8D Canova Museum Extension. Carlo Scarpa

Then, we could say that these morphosyntactic and morphosemantic codes in Scarpa's architecture transform themselves into a content code signifying his architectural approach, a reference to his idiom. This idiom is close to the extensional mode of composition emphasising assemblages of elements and their relationships rather than a common property expressing the whole. Wholeness in the work of Scarpa is not of greater significance than the ways in which permeability and visibility relationships structure the perception of the work, or the ways in which the fragment evokes the whole in the mind of the viewer. For Scarpa, the work takes shape in the process of moving and viewing rather than through a two-dimensional drawing, plan or elevation. The work becomes the process of interaction between the physical reality, the time-based encounter of the viewer with the building, and the analogical processes that bind the morphology of the building to Venice in the mind of viewer (*ibid.*).



*Tokyo Museum (Le Corbusier); Barcelona Pavilion (Mies van der Rohe); Orphanage at Ijbaanpa, Amsterdam (Aldo van Eyck)* (Figure 9A-D). Scarpa's constructive ability took shape by the encounter of the Venetian tradition with the tenets of modernity. As modernism broke with the past, architects searched for alternative ways of expression outside a given canon, 'disrupting axial symmetries and centralities, breaking corners, and opting for deformed and irregular patterns' (Tzonis & Lefevre, 1986, 279). The geometrical centrality of the void in Le Corbusier's Tokyo Museum (figure 9A) for example, does not correspond to configurational centrality which is distributed in the four corners of the building. The partial overlap between the two domains of properties turns the morphosyntactic dimension to a morphosemantic expression of modernity (and Le Corbusier's idiom based on frequent repetition of this theme), balanced between a classical form-of-a-class and an anticlassical syntax-of-a-class.

Unlike Le Corbusier, who dissociates geometric centrality from syntactic centrality, in the Barcelona Pavilion Mies van der Rohe dissociates oblique visual alignments from the orthogonal axial alignments of the walls and the physical fabric (figure 8B). The organisation of optical relations however, substitutes perceptual centrality for geometrical and syntactic centrality (figure 8C) (Psarra, 2009). In both cases the partial overlap between formal and syntactic domains are the means of questioning the quasi automatic routine application of the classical canon, which has been traditionally based on the intentional mode of composition.

Studying the architectural language of Classicism, Tzonis and Lefaivre (ibid.) discuss a series of figures in the classical art of rhetoric, suggesting that formal parallels between language and architecture reflect common cognitive structures. One of these figures is *parallelism* in which 'architectural elements, parts, members, or details are inscribed in similar geometrical shapes and are placed in such a way in the composition that their corresponding constituent lines are parallel' (ibid.: 153). When elements are placed in a way that these lines are in a right angle we have a figure of *contrast*. In the Orphanage at Ijbaanpa van Eyck uses both parallelism and contrast to organise a repetition of modules around courtyards. The organisation of syntactic centrality picks up the motif of the right angles. However, it is concentrated at the centre of the plan rather than being distributed in the various modules, defining another example of an extensional design mode.

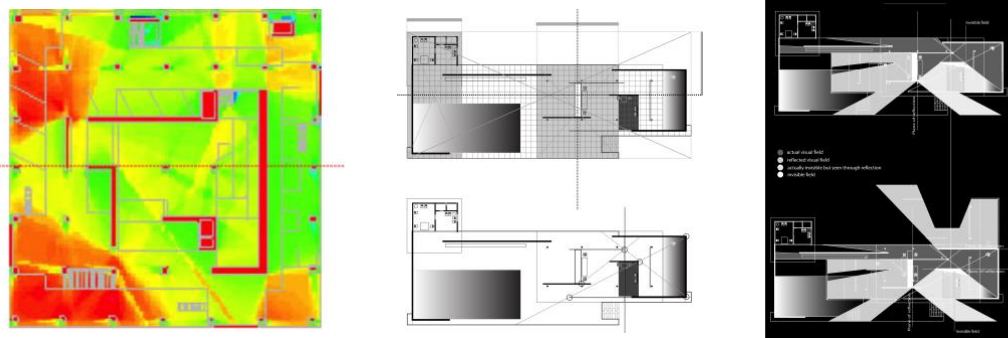


Figure 9A-C From left to right: Tokyo Museum (Le Corbusier): VGA Integration (A); Barcelona Pavilion (Mies van der Rohe) - geometrical alignments (B top), visual alignments (B bottom); Barcelona Pavilion, isovists through real space and through reflections (C).

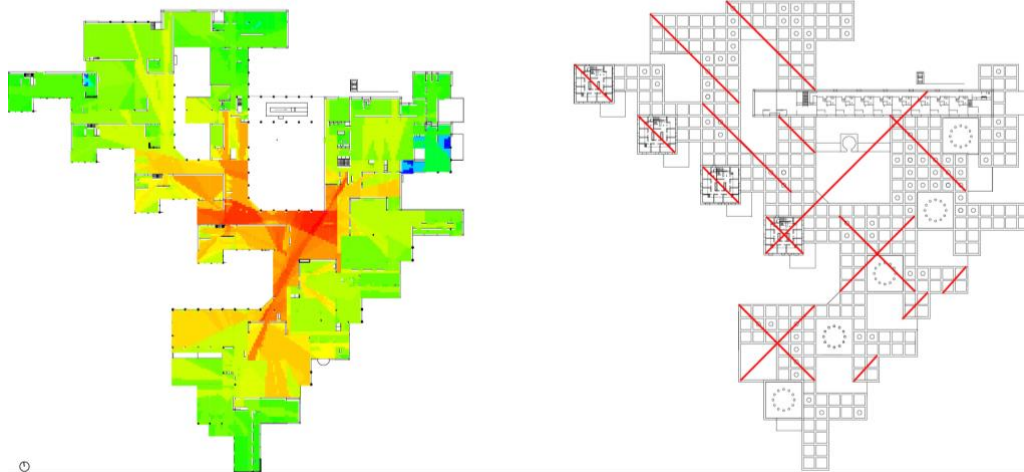


Figure 9C-D Orphanage at Ijbaanpa, Amsterdam (Aldo van Eyck): VGA Integration (C); roof plan showing the formal principles of parallelism and contrast (D).

*The Jewish Museum, Berlin (Daniel Libeskind) (figure 10).*

Three underground axial routes, each telling a different story shape the building. The first leads to a dead end – the Holocaust Tower. The second leads out of the building into the Garden of Exile and Emigration, remembering those who were forced to leave Berlin. The third and longest route, leads to the exhibition spaces of the museum in the upper level, emphasizing the continuum of history. The zigzagging plan of the building in the upper level is cut by a set of voids expressing interruption and absence. In order to move from one side of the museum to the other, visitors must cross one of the many bridges that open onto this void. When a linear element becomes a morphosemantic rule, a metaphor for a route, it is addressed as something symbolic, abstracting history to one-way paths and impenetrable voids. The ways in which the building is organised through conceptual and spatial relationships can be detected only from patterns governing the form-of-a-class as seen in plan. Constructing disorientation, the syntax-of-a-class is bent to serve the form-of-a-class, adhering to a set of pre-assigned meanings.

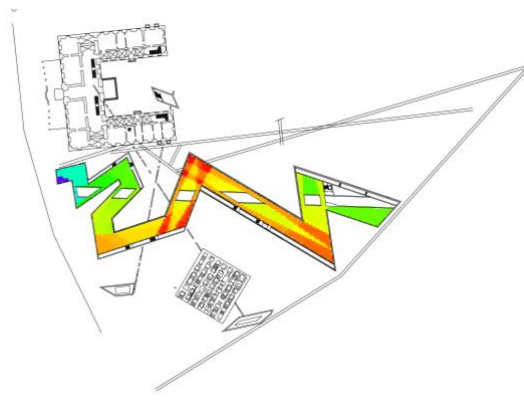


Figure 10 Jewish Museum, Berlin (Daniel Libeskind): Ground floor (A); First floor (B)





## 8 CONCLUSIONS: (CON)FIGURATION

Students of Bill Hillier may recall two articles he used to issue for discussion during the first weeks in the Advanced Architectural Studies MSc Course in the 80s and early 90s: Alan Colquhoun's 'Form and Figure' (1978) and his own article 'Quite Unlike the Pleasures of Scratching' (2005). 'By form I mean a configuration that is held either to have a natural meaning or no meaning at all. By figure I mean a configuration whose meaning is given by culture, whether or not it is assumed that this meaning ultimately has a basis in nature' (Colquhoun, *ibid.*). Deeming form culturally meaningless, Colquhoun was criticised in the course seminars, by an argument supporting significance over signification (Hillier, 1985; 2011). What Colquhoun meant by figures is not so much architectural elements, as 'tropes', lying in the classical tradition of figurative language and rhetoric of Aristotle (1975 [c. 340 B.C]) and Cicero (1954 [c. 80 B.C]). The analogy of architecture with language has obvious limitations, particularly ordinary language serving the purposes of transmitting a message as a pre-given realm of meaning (see Libeskind's Jewish Museum). However, the morphological properties of language, especially figurative language, can be useful tools complementing the configurational analysis of social structures, and the study of architectural creativity, what we can call *morphopoesis* or the poetics of making. Architecture is fundamentally a language of (con)figuration – a composite term - denoting configuration as *forming, shaping, making*, and figuration as *representing*.

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