

URBAN RHYTHMS: historic housing evolution and socio-spatial boundaries

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ABSTRACT

This paper discusses part of research in progress that studies the potential role of spatial boundaries in historic housing transformations. Boundaries are considered here to be the spatial locations where the socio-spatial scales overlap and potentially interact. The socio-spatial scales that are discussed here include the building scale/domestic interior and the urban block/urban neighbourhood. Moreover, the urban block is considered in reference to the background context of the urban area/local community. Overall, this research aims in studying housing transformations from an urban scale perspective; namely, to form an approach that is holistic in its scope. Thus architectural design and urban planning are studied in reference to each other, by relating the domestic interior to urban landscape, whilst taking into consideration the social solidarities that these spatial patterns support.

It is suggested that spatial boundaries control the flow of social users in spatial patterns, being at the same time potential interfaces at different scales of activity where the individual is (successively or abruptly) transformed from inhabitant, to commuter and to citizen. Accordingly, as it will be discussed, the way the transition between the socio-spatial scales is structured defines whether the boundary divides, connects and allows interaction between these scales. More specifically, this paper focuses on the street-dwelling relation and on how the public-private interface shifts over time. The study aims to analyse whether boundaries shift in response to changes in society and consequential changes in built form.

The methodological approach is based upon a study of the relationship between the architectural and morphological aspects of space (Conzenian approaches) with the analytical measures of Space Syntax Theory (Griffiths et al., 2010), and done so for all studied scales (urban area, urban block, residence unit). The intention is to relate the architectural-morphological properties (in a way the three dimensional configuration) of the housing typology to the scale of the urban block and its surrounding area. In particular, the housing typology discussed in this paper is the New York row-house and the way it evolved within the historic spatial patterns of the city's West Village. The study shows how the forces that shaped the built form around the studied street, Grove Street, have implemented shifts in the boundary of the building with the street, transforming in turn the public-private interface and the neighbourhood profile.

INTRODUCTION

This research discusses housing design considered from an urban scale perspective. The intention is to present the socio-spatial urban context within which various housing typologies have emerged and shifted throughout a city's historic urban evolution. Therefore the methodological approach presented here aims to study architectural design and urban patterns in reference to each other. The domestic interior is related to the urban landscape, whilst taking into consideration the social solidarities supported by each spatial scale, namely: the building/domestic interior and the urban block/urban neighbourhood, are discussed. In order to do so, the socio-spatial scales are considered here with an emphasis on the spatial locations where these scales overlap and potentially interact; in other words, emphasising *boundaries*. The subject will be approached through the use of Space Syntax analytical tools in combination with established representational methods from the field of Urban Morphology.

The discussion developed throughout this paper is part of research in progress that aims to study the potentials of spatial boundaries between a city's scales (domestic space-family, urban block/neighbourhood-local community, urban area-social solidarity) to work as spatial and social interfaces. An additional intention is to examine the potential role of urban interfaces in determining the character of social integration in (or segregation from) the communal life. Lastly, the *study aims to analyse whether boundaries shift in response to changes in society and consequential changes in built form. For this purpose, the study also analyses how boundaries shift over time.*

The street-dwelling relation lies at the core of this study, as it is central to understanding the interaction between the urban and the building scales. This relation is explored through the study of the boundary configuration and whether this works as an *interface*, a *threshold* or a *division* between the public and private domain – as will be explained below.

Finally, in order to understand the boundary performance – in relation to the levels of its adaptation to various urban and housing transformations – there is a need for a historic study of significant housing typologies and of the urban spatial units that supported them (plots, blocks and grid organisation). In particular, this paper presents a sample of research in progress that studies the historical evolution of row housing in the city of New York. The choice of row housing stems from a desire to choose a building type that is common across the two centuries of building studied and that crosses social boundaries; examples exist of both modest and grand dwellings of this type. The study area is focused on street blocks that frame Grove Street, which is located in the urban neighbourhood of West Village.

The paper opens with a review of the theoretical ideas that framed the study. This discussion will refer to matters of urban phenomena and city evolution, whilst taking into consideration the discourse concerning the social implications that are embedded in (or generated from) spatial patterns. Moreover, this theoretical discussion will justify the reasoning for selecting - for the scope of this research - a historic, cross-scale study with emphasis on boundaries. In turn, ideas regarding boundaries and the spatial articulation of urban scales will also be presented. It is argued that boundaries - and indeed boundaries within a cross-scale perspective - appear to be a neglected issue in the socio-spatial research domain. The few exceptions to this are found in the work of Julienne Hanson (Hanson & Zako, 2007; Hanson, 2000). Bobic (2004) has also studied '*transition as urbanity interface*', from a more architectural-morphological perspective. Taking into account this paucity of research, the second section mainly outlines a suggested theoretical and methodological approach to studying boundaries.

After having set the theoretical framework, the methodological approach will be presented through the study of the example of Grove Street. In an effort to compose a multileveled description of the spatial patterns and the implications regarding their social functioning, the methodology was built based on its relevance to addressing two levels of spatial performance:

1. The *two dimensional operation* of the spatial system, which refers to matters of connectivity and spatial organisation-articulation of the various '*urban units*'; namely, from the domestic interior to the urban landscape, from the building to the street domain. This level addresses therefore mainly the diagrammatical and syntactic properties of the spatial patterns as these are organised based on a two-dimensional plan. Space Syntax Theory provides the methods and tools for analysing spatial performance at this level.
2. The *three dimensional operation* of the built volume; in terms of its density, height and footprint within the urban landscape, as well as in terms of scale (in relation to human scale) and of how the morphological properties (namely the geometry, form and size) of the parts (urban units, sub-units and super-units) relate to each other. In other words, the architectural and morphological properties of the built form are addressed with the use of established representations (maps and drawings) coming from the field of Urban Morphology and of architectural reading. Conzenian approaches have established such methods of reading urban patterns, analysing the morphological properties of buildings, plots and street structures by mapping their distinctive phases of historic evolution (Griffiths et al., 2010; Conzen, 1960, 1968; Whitehand, 1981, 1987, 2007).

Both the two and three-dimensional aspects of spatial performance will be related to the social context and functioning they support (for instance, whether they support residential or other land uses or a mixture of both). As mentioned before, here the studied local socio-spatial scheme comes from the New York urban scenery, and more specifically, from the city's West Village.

1 – ADDRESSING CITIES' COMPLEXITY

The theoretical framework upon which this research's scope was founded can be summarised in three basic concepts; the '*bottom-up*' approaches (Jacobs, 1961; Alexander, 1966), the '*space syntax*' paradigm (Hillier 2008) and the '*evolutionary paradigm*' (Marshall, 2009). In other words, this study deals with the 'urbanity' phenomenon: based accordingly on these three key ideas. Respectively, the approach treats cities as 'highly relational systems' with complex organisation, as socio-spatial entities (Hillier & Vaughan, 2007), that are resilient to change and persistent through time (Marshall, 2009, p.13-15).

The significance of understanding cities' complexity was suggested by authors such as Jacobs (1961) and Alexander (2005, 2002a, 2002b, 1979, 1966), through their arguments against the mechanistic and 'top-down' scope of Modernist planning propositions. Approaching the problem of cities through processes of 'top-down' thinking refers to ideas that cities should be conceived as objects whose functional efficiency can be predetermined, controlled -and in fact restricted regarding its potentials- by design. As Batty and Marshall explain (2009, p.563), these ideas are highly related to "*scientism, meaning the application of science to human affairs in the form of social engineering and policy analysis*".

In contrast, Jacobs suggested (1961, pp. 428-448) that the problem that cities constitute should be addressed through inductive thinking and 'thinking of' processes. This implies a consideration of city

organisation as a complex field where multiple variables are “*interrelated into an organic whole*”. Accordingly, inductive thinking means retrieving information concerning the complex whole through the study of its sub-components; namely it refers to a bottom-up approach. Furthermore, the ‘thinking of’ processes opens up a conceptualisation of cities as more “*probabilistic systems*” (Hanson & Hillier, 1987). In a probabilistic system the organisational consistencies are traced to relations and processes rather than in the components of the system themselves (Marshall 2009, p. 257-259), nor in a city’s order itself (*ibid*, p. 255-257). In that sense, cities, when considered as probabilistic systems, are driven by evolutionary processes that might generate, reproduce and transform urban phenomena over time.

The ‘*space syntax*’ paradigm proposes that space is not just a background to human activity. Instead, it acts both in a ‘*conservative*’ and a ‘*generative*’ way for the city’s background network of residential areas and foreground network of non-residential activities, respectively. Namely, space is both shaped by social contexts (in a sense that it is a reflection of them) and can shape or generate them as well. More specifically, the theory of ‘*natural movement*’ (Hillier et al. 1993) discusses how space can shape movement and co-presence by defining possible distributions and encounters of physical users that are at the same time social users as well. Considered in that way, the society-space relation is re-formulated based on a constant structural negotiation, with the ‘*physical city*’ ‘being the either side of the ‘*social city*’ (Hillier and Vaughan, 2007).

In this paper, in order to understand this negotiation in terms of evolutionary processes, a historic study was devised so as to follow evolutionary pathways of urban ‘parts’ and at the same time relate them to the evolution of the urban ‘whole’ (Hillier, 1992). It is suggested that as these relations evolve, they become more complex and shape and re-shape the parts, as well as the whole, drawing references from one to the other. Clearly the term ‘evolution’ itself suggests notions of persistence through time and thus, demands a historic study. Furthermore, by following and understanding the historically granted relations between space and society, the aim is to grasp the overlaps of their evolving processes and how the needs of each component feeds back to the evolution of the other.

A crucial contribution to the theoretical discourse regarding this direction has been the notion of ‘*spatial configuration*’ introduced by Space Syntax theory. Spatial configuration represents spatial patterns as ‘highly relational systems’ and in constant liaison with the social patterns they support (Hillier & Vaughan, 2007). Focus is not only on relations between components of the system, but also the parts with the whole - namely the global and local scale.

Analysis at the global scale relates to the physical and social city as a whole, as one system. The local scale refers to the city’s sub-systems that comprise the whole, to socio-spatial entities (urban area) that may present their own local character, but are at the same time parts of the whole urban structure. Within the realm of the local scale are smaller entities such as the urban neighbourhood (an urban block and its surroundings). Since this study aims in deconstructing the city in order to adopt a bottom-up approach on understanding processes of urbanisation, focus is made on the local scale, whilst considering it in reference to the context of the global structure.

The scope framed each time by the studied scale defines accordingly what can be considered as urban ‘unit’ and ‘sub-units’. For instance, when studying the relationship between urban districts in respect to the global scale, the district could be considered as a ‘unit’ and the blocks formed within it as ‘sub-units’. When the focus of study is on the other hand on the urban districts themselves, then the blocks could be taken as ‘units’ and the city as a ‘super-unit’. Additionally, when talking about more abstract notions -such as the

'urban neighbourhood'- whose spatial effectuation is not necessarily tangible, the problem of classification of 'units' becomes even more complex. Marshall (2009, p.60-68) clarifies this problem by defining the 'fundamental urban units' that come from the following three different spatial categories: *the three-dimensional units, the two-dimensional units, and the linear units*. These are accordingly the individual buildings, plots of land, and routes and they refer to the 'physical city', while forming a 'city-shaped' urban order by creating in turn composite units such as streets and squares.

The different urban units reflect the different roles that an individual moves through as a member of the social city. Whilst within dwellings the individual is an inhabitant – or a visitor, individuals have the potential to be part of the local community in part due to the possibilities effected by the plot layout. Relations of proximity, density, articulation – shape the presence and co-presence of individuals with their immediate environment. Finally, configuration and urban layout will influence the distribution, co-presence and mixing of locals and strangers within the whole urban system; shifting roles into strangers-citizens, visitors or passers-by. This analogy brings out the fundamental units of the social scale as well. The following section discusses the role of spatial boundaries in articulating the fundamental 'units' and in constructing interfaces across socio-spatial scales.

2 – UNDERSTANDING BOUNDARIES

The differences between what is considered as *boundary*, as *threshold* and as *interface* need to be clarified at this point. These differences derive mainly from their potential role to *divide*, *connect* and *allow interaction*, respectively. Namely, the nature of a *boundary* presents the fundamental property of disconnecting (Hillier & Hanson, 1984, p.144) - and simultaneously defining - two domains; the domain that it encloses (interior) and the one that surrounds it (exterior). Despite the physical division, the boundary also constitutes a primary social division for two groups: the users of the divided spatial domains; namely, the users of the internal structure (the inhabitants) and the users of the external domain (the strangers). In turn, the potential interaction of the divided domains depends on the existence of *thresholds* within the boundary configuration and the potential for the boundary to work as an *interface*. The notion of *threshold* implies an entrance, while the *interface* suggests the allowance of interaction between the bounded system and its exterior. In other words, whilst threshold implies transition and therefore a change of status for the user, this is not necessarily the case for an interface. Furthermore, clearly an urban boundary is most likely going to constitute an interface in some parts of its configuration and to present at least one threshold in others.

Finally, boundaries are spaces that are influenced by the interrelations of complex socio-spatial domains. Accordingly, boundaries that structure the interior of the primary socio-spatial scale are usually referred to as *partitions*. Partitions divide functions within the interior domain and structure an arrangement of private, communal spaces and intermediary ones (semi-private, semi-communal). In the case of the building-block division, the boundary works as the intermediary between the public domain and the private [see Newman's hierarchy of publicity to privacy (1972, 1975) and *Urban Forms; The Death and Life of the Urban Block* (Samuels, Panerai et al, 2004)]. Boundaries here can be *primary*, namely formed by the building line per se, or *secondary* - like walls and fences - in which case they divide the plot to the street (Hanson & Zako, 2007; Hanson 2000). Finally, for the city-urban area division, boundaries can be specified by the area's morphology and may be defined by the 'street syntax' [the rules and relationships between buildings, plots and routes (Marshall, 2009, p.79- 82)], for instance, either by a main vehicular artery, or by topological and

geographical characteristics, or by a characteristic shift of the internal local spatial configuration in relation to the global one (Yang and Hillier, 2007).

3 – CASE STUDY: THE EVOLUTIONARY PATHWAYS OF GROVE STREET

Greenwich Village is one of the oldest parts in the city and hold until today possibly the greatest selection of dwellings dating from when New York was the Dutch colony of New Amsterdam. Greenwich's urban grid dates from 1790, when the well-to-do citizens of the young Republic bought or inherited the country estates of the area. Surveyors were hired at that time in order to plan a street patterning and a plot configuration that would organise building development. In general, the new streets followed the direction from existing main routes, such as Skinner Road (now Christopher Street), Greenwich Lane (now Greenwich Avenue), and Greenwich Street. The presence of the Village was established in 1812 with the development of a public market. This initial strong socio-spatial presence protected the area westwards of Sixth Avenue from the Commissioners' plan of 1807-11. The Village has managed to maintain its gridiron street pattern, despite its deviation from the Commissioners' plan, which was implemented in the rest of the city development (see *Fig.1*). This angular

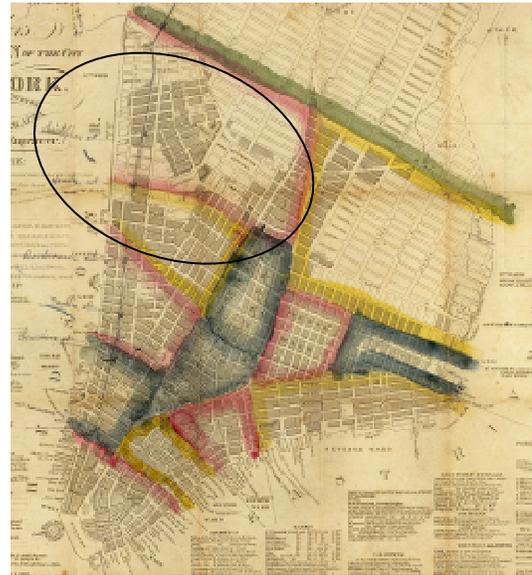


Figure 1. West and Greenwich Village in a Manhattan map c. 1829 by W .Hooker; from the David Rumsey Map Collection.

grid disruption created a boundary to the through traffic and pedestrian flows of north-south avenues and - along with the fact that residences in the area were family-owned for generations - this feature enabled the preservation of a substantial part of the historic buildings in the area. By the 1920s the changes in the surrounding urban context had turned the Village into one of the best-connected areas in the Manhattan grid, and thus threatened the preservation of the old neighborhood socio-spatial context, due to pressures of development at a scale to match what was taking place elsewhere in the city (*Fig. 2-5*). These grid transformations refer to the extension of Seventh Avenue southwards in 1914 and the completion of a second subway system in 1918 that came along with the southern extension of Sixth Avenue.

More particularly, the analysis of the current Manhattan grid through the Depthmap Software (a spatial network analysis Software by Alasdair Turner, based on Space Syntax Theory) shows the potential to-movement that the studied area presents in a local scale (radius studied $r=2000$). The values indicate a high connectivity of the area to its surroundings after the grid alterations. Similarly, the junction of Seventh Avenue and the studied street -Grove Street, presents high potentials in attracting retail uses, as shown by the distribution of metric choice values for the same radius range (Hillier et al., 2007).



Figure 2. Manhattan c. 2010 showing Segment Angular Integration $r=2000$

The analysis shows that the study area has a peak of potential to-movement at the junction of Grove Street and Seventh Avenue.



Figure 3. Manhattan c. 2010 showing Segment Metric Choice for $R=2000$

In the current grid (after the extension), the values of choice that are related to retail uses pick up the studied area.



Figures 4, 5. Grid transformations for Grove Street and its surroundings (detail on left). Grid and site changes are marked with red.

The architectural styles that dominate the Grove Street area are (in chronological order): Federal, Greek Revival, Italianate, French Second Empire, Neo-Greek and Queen Anne (Historic District Designation Report, 1969). There are also some examples of transitional style buildings. Moreover, the area has a mixture of modest and 'grand' examples, which reflect the mix of social status of the area's residents. The choice of row houses as being the focus of study is confirmed by the fact that the Designation Report (op cit) highlights the fact that this style of building appears in all the aforementioned styles. Additionally, it reports the later trend towards apartment building erection at the close of World War I. This trend came as an outcome firstly, of the Seventh Avenue extension that crossed through the area in 1914, and secondly, of the Broadway-Seventh Avenue subway line construction in 1918.

Grove Street intersects with Seventh Avenue, which was extended towards Houston Street at a relatively late date. The street has examples both of privately initiated alterations and more organised redevelopments. A variety of sources - research by Andrew Dolkart (2009) for the area, the Atlas of Manhattan for the years of 1879, 1921 and 1955 (updated 1975), and a current field study (2011) - were used to map building, demolitions alterations and changes in block organisation over time within and around Grove Street. See Figure 7, where transformations are coloured according to age (the deepest red indicates the oldest transformation).

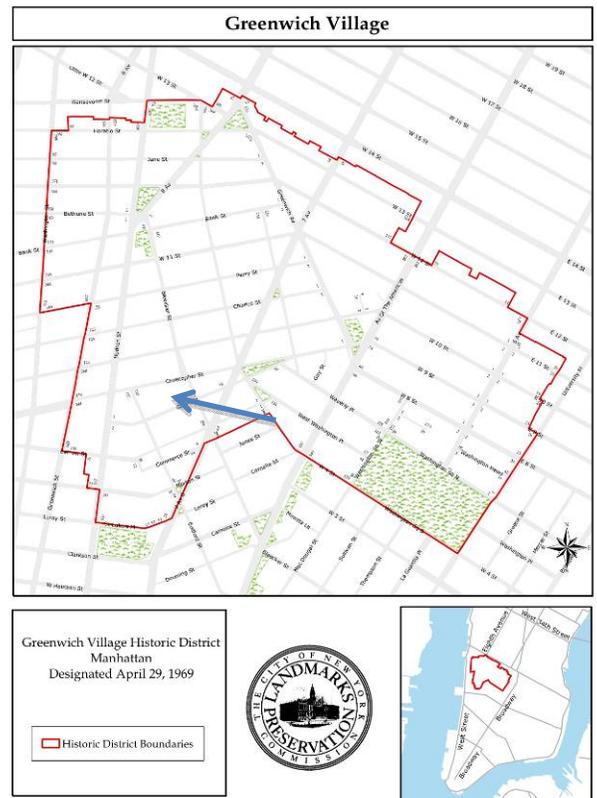


Figure 6. Greenwich Village Historic District (as established in 1969)

The segment analysis suggests that the strategic connection of the area to its surroundings via the north-south Avenues had an impact on its land uses. It is likely that the ‘*multiplier effect*’ (Hillier, 2002, p.153) of pedestrian movement travelling through the streets at a rate and scale over and above the expected levels for a residential area, had the outcome of attracting retail and service uses to the area over time. Accordingly, the parts of the blocks that face the streets with the best connectivity to the rest of the Manhattan show a stronger shift in land uses. In contrast, the background street façades maintain the primary residential character of the area. In *Figures 8, 9, 10* that record the residential and non-residential (mixed residential) uses of the ground floor over the studied time periods, it is shown how the retail/service uses of the eastern part of Grove Street (which is in Junction with the north-south route via the Seventh Avenue extension) are penetrating the westward residential buildings over time.

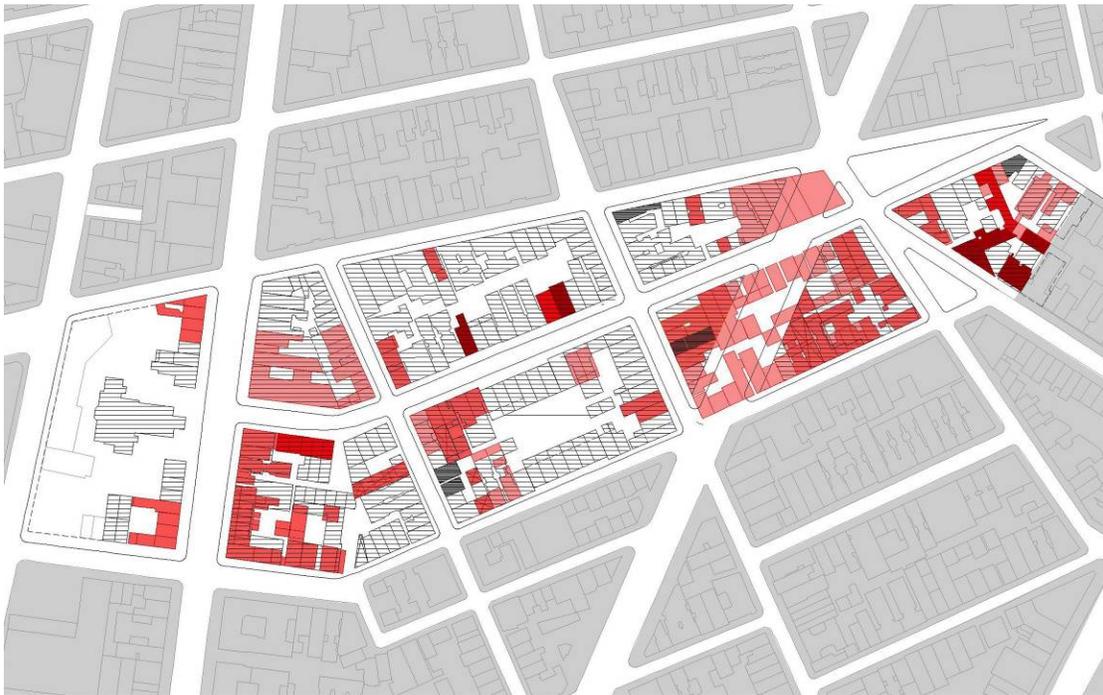
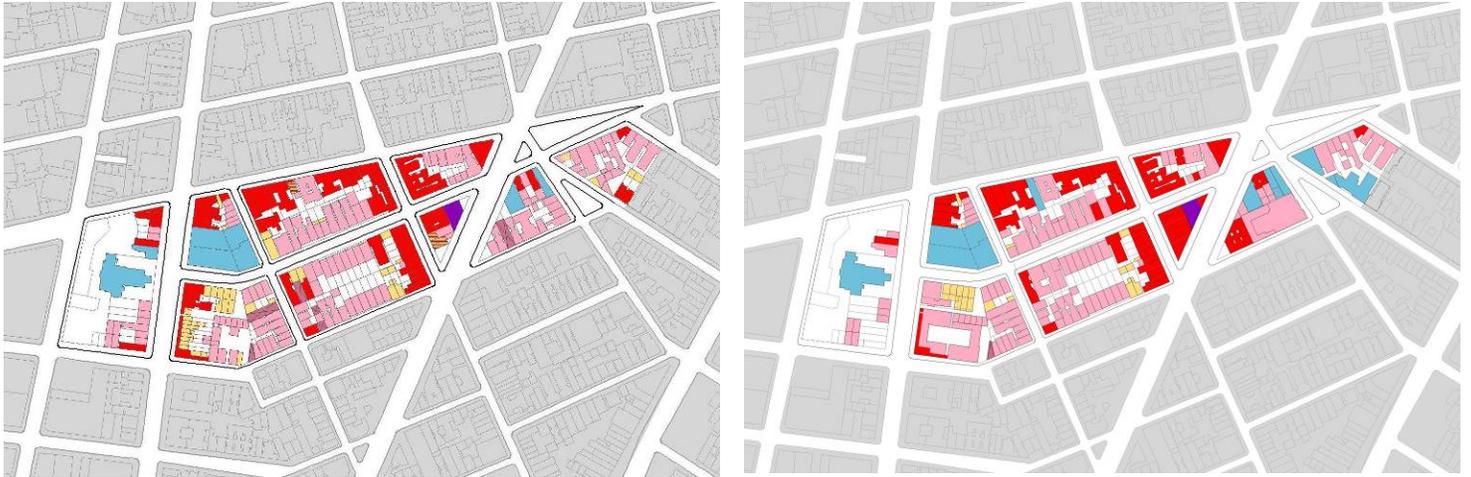
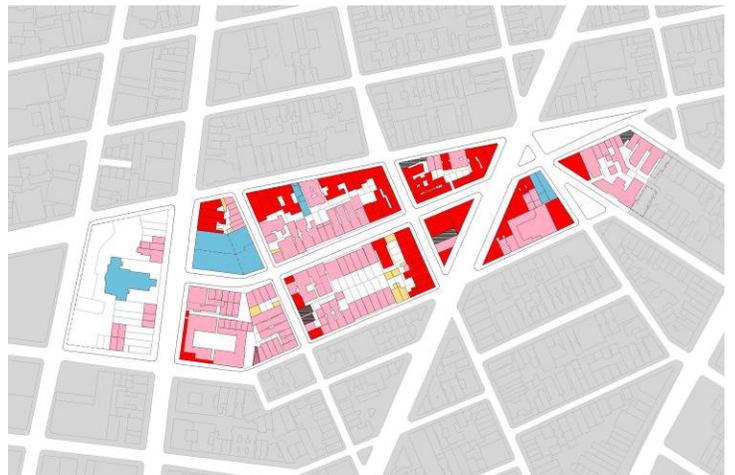


Figure 7. Mapping of historic transformations in the built form for the period 1879-2011. The deeper the red colour map indication, the older the transformations.



Figures 8, 9, 10. Allocation of residential and non-residential uses. Above the allocation as recorded in the 1921, 1955 (updated 1975) Manhattan Atlases by Geo. W. & Walter S. Bromley. Under the allocation as recorded by field study in 2011.

- | | |
|------------------------|---|
| RESIDENTIAL USES | BRICK BUILDING |
| | BRICK STABLE |
| | FRAME BUILDING |
| | FRAME STABLE |
| MIXED RESIDENTIAL USES | LOFTS |
| | STORES ON GROUND FLOOR (residence above) |
| | OTHER |



Since 1961 (*Fig.11*), the studied blocks that surround Grove Street have belonged to both residential and commercial zoning districts. The significance of this is that in a commercial zone the option of taller buildings is allowed where there are larger blocks. High lot coverage constitutes another option, but here height limits are implemented. This is reminiscent of the lower scale of the pre-1961 apartment buildings. Finally, buildings facing Seventh Avenue (that was later introduced at this part of the city grid, in 1914) are subjected to C4-5 zoning regulations. These refer to more densely built regional commercial centres that extend beyond the neighbourhood limits and include retail and service uses.

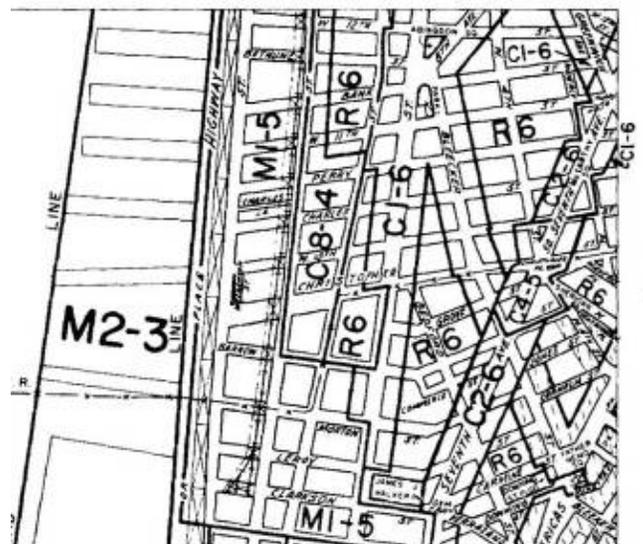
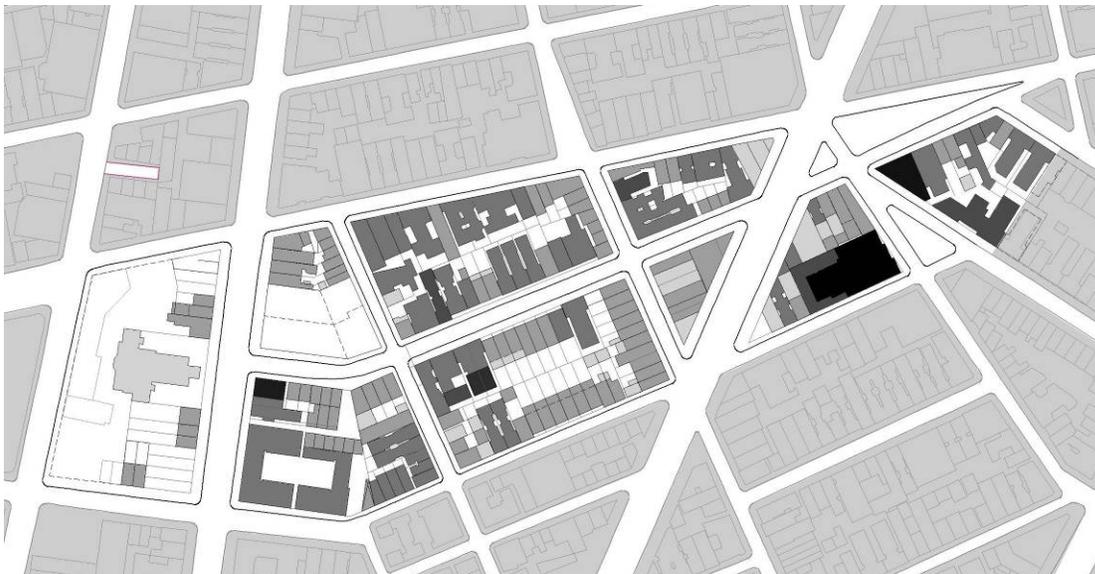


Figure 11. Zoning Map, City Planning Commission, December 1961

The controversies that shaped the area are unsurprising: on the one hand the early street pattern enhanced the preservation of the historic built form. The later implementation of height restrictions (see *Figures 12, 13*) has limited significant changes over time. This is striking, considering the pressures for land use changes and zoning limitations have a similar outcome of constraining mass redevelopment. A similar set of pressures has come about due to the relatively recent extensions of highly integrated streets (such as the Seventh and Sixth Avenues) and the subway construction in the area. The subsequent increase in the area's centrality as well as in pedestrian traffic might have endangered the area's preservation, but due to the strong limitations on major redevelopment the outcome has instead been to have piecemeal transformation of individual buildings as well as changes in older buildings' interface with the street. In the following paragraphs, the role of boundary adaptation will be discussed in order to examine the nature of these transformations.



Figures 12, 13. Built form height transformation. Above: building heights in 1921; under: building heights in 1955



3.1. The interface: the 'public in the private', the 'private in the public'

A precondition for an attempt to understand the boundary arrangement and its potentials is looking at the block and lot organisation (Fig.14), which influences both the rhythm of the building façade and consequently the street façade as well. Since the early nineteenth century the typical row house plan (Federal Row Houses), was established at between twenty to twenty-five feet wide and thirty-five to forty feet deep (Lockwood, 1972, p.14). The row houses around Grove Street ranged within these front dimensions, but are slightly deeper at forty to forty-five feet. Most lots have a depth of ninety-nine feet, allowing space for a back garden. Exceptions to this only occur in the blocks that have been cut through by the later street extensions, resulting in triangular lots and buildings.

The fact that the built form is organised in such a systematic way created a consistent rhythm and symmetry in the development of the street façade. Usually each building façade is divided into three equally sized horizontal bays, where the windows are respectively arranged. Moreover, the building heights and the narrowness of the lots maintain a human scale in the built environment. This is also supported by the architectural design, which distinguishes one row house from the other, either with a clear entrance demarcation (usually with *stoops* - stepped entrances or porches) or with decorative or material differentiations. This rhythm allowed later on, the preservation of the façade template when joining two or more row houses to create apartment buildings (Dolkart, 2009, p.155-161).

Each period's demand for higher densities, which came as a result of shifting lifestyles and growing urbanisation [single artists in the beginning, professionals as the real estate redeveloped the area's houses; (Dolkart, 2009, p.169-177)], demanded a different façade alteration in turn (usually internal organisation as well). The early twentieth century influx of artists led to many row houses and old tenements to be altered to serve the aesthetic and functional (studio/workspaces) of this group (see Photo 1). These alterations appeared in the street façade, especially with the large window horizontal casements. The wide horizontal open front was also adapted for ground-floor shops. In this case, the large window opened up the shop interior towards the street, creating a more public interface that allowed interaction between the shop visitor and the moving pedestrian. The pavement's use was extended visually (and accessibly) to the interior and vice versa. Often, in order to increase this interaction, the stoop was removed and replaced with direct entrances from the street. The stoop removal was also common in alterations that transformed the single-family row houses into two or more apartment units. Since the late 1920s developers and housing alterations have started to be directed at young single professionals, who could afford higher rents than artists. One such case of transformation will be presented in detail in the next part.

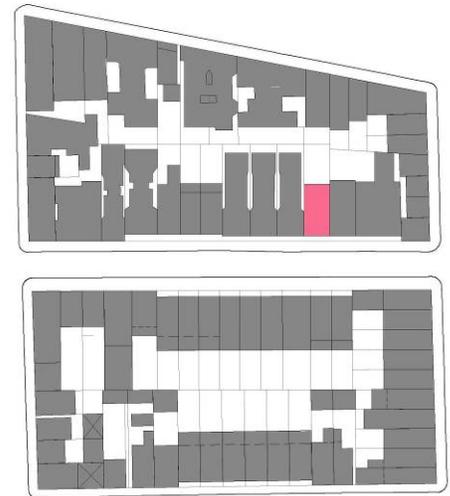


Figure 14. Grove Street: block configuration.
Indicated residence: building No 39

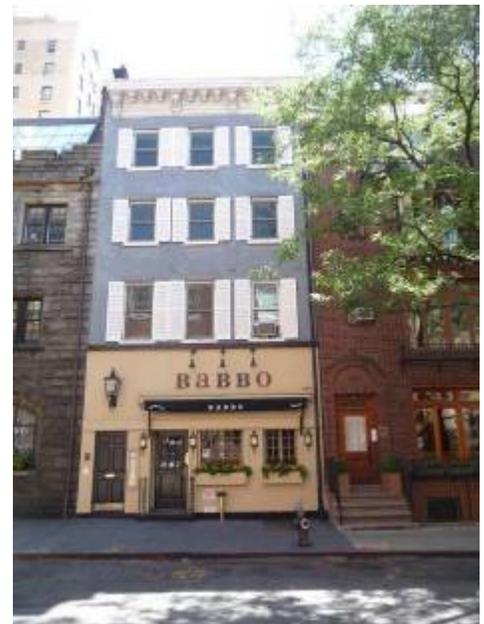


Photo 1. Façade alterations.
Left: studio windows at the attic floor
Middle: stoop removal and additional entrances for the non-residential use.
Right: stoop entrance and large horizontal window casement

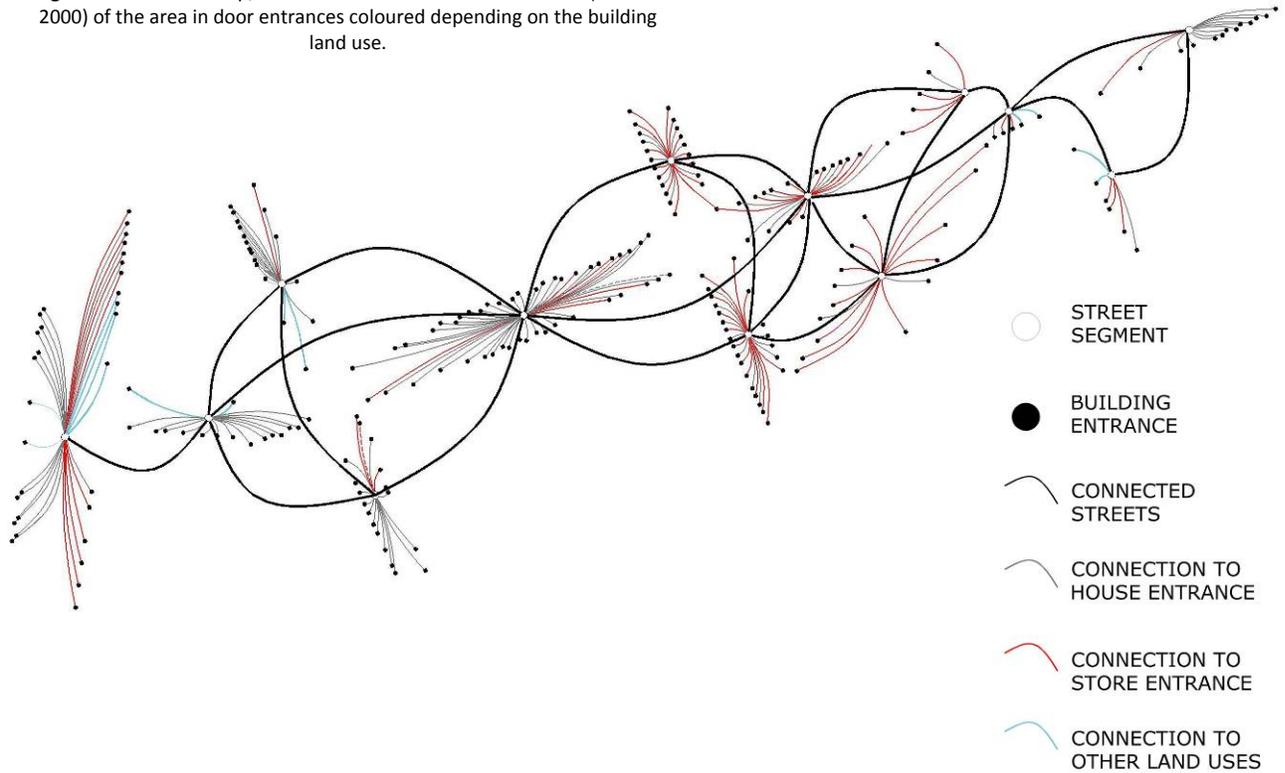
The underlying rhythm that worked as a template, along with the shifting over time socio-economic context of the area have created a patchwork of different types of boundaries. Figures show the way in which primary boundaries (direct entrances; Hanson, 2000) are mainly located in the more urban street fronts, while secondary boundaries compose the more residential street scenery (Hanson, 2000; for this case study such boundaries included one or more transition spaces between street-building interior, upwards or downwards stoops and different types of fence). Especially regarding the stoop configuration, Bobic (2007, p.105) comments that this type of boundary between the private and the public domain creates an 'associated' interface that manages to maintain a 'subordinate status' for the two intersecting -and potentially interacting- domains of the building interior and the street. As represented in the *Figures 15, 16* this rhythmical variability in type and boundary configuration (placement, height, width and material/opacity/visibility) constitutes a vivid architectural scene. That could be argued to be a way in which the built environment has in this case, absorbed, assimilated and expressed the urbanisation processes. The density of door entrances and the mixture of land uses they refer to can be seen in the interface map (*Fig. 17*: showing door entrances in relation to street patterns; see Hanson, 2000), which indicates how public and private domains are interrelated with tight proximity, accessibility and visual contact.



Figures 15, 16. Grove Street: Boundary types



Figure 17. Interface Map, indication the 'constitutedness' levels (Hanson 2000) of the area in door entrances coloured depending on the building land use.



3.2. Transforming the row-housing typology/ the flexibility of the plan

The analysis suggests that the shifting character of the residential parts of Greenwich and West Village came as an outcome of the division of single-family houses into two or more apartments. As commented in *American Architect* (1920), in a discussion regarding this evolving new neighbourhood profile, these transformations were driven by an effort to maintain the picturesque neighbourhood qualities of the old



built environment. In the same discussion it was claimed that this maintenance of old neighbourhood references was achieved through changes in the street façades of the buildings (p.146). These efforts were soon followed by real estate practices and developer intentions. The row house alteration presented in detail below, is interesting for two reasons; firstly it represents the shift in the social status of the area's inhabitants (from families to young artists, single professionals or single women) that turned the typology into studio apartments, and secondly, it constitutes according to Dolcart's records (2009), a representative example of how the New Tenement Building Regulations were used by developers to their advantage. By building apartments without kitchen facilities (although in reality providing these facilities in 'dressing rooms'), developers were able to have them designated as 'non-housekeeping' (Dolcart, op cit) studio

spaces for young single professionals.

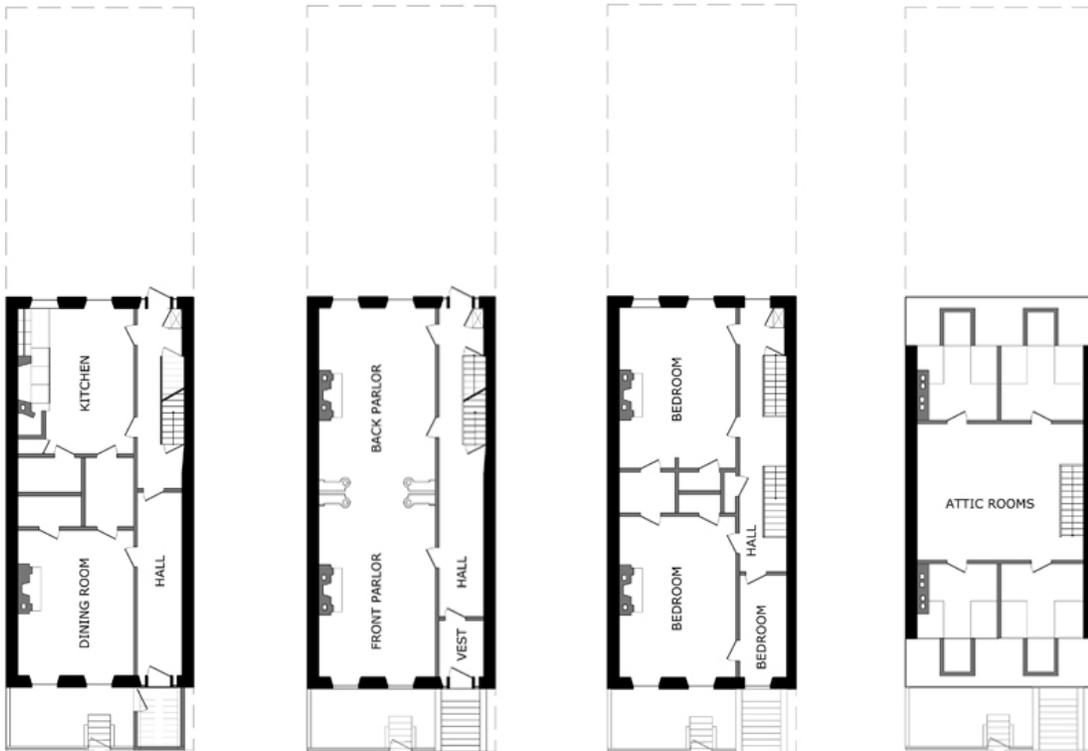
In this period domestic organisation shifted dramatically, with stairs and partitions re-organised to form a new spatial configuration of two apartments for the upper floors, while the basement was re-designed in order to be occupied by a shop. See analysis of the example of 39 Grove Street, below. As far as the residential space is concerned, it is interesting to note how the interior organisation made it easier for these alterations to occur without changing the built volume significantly. The architectural design of the new apartments, which were two for each floor, maximised space exploitation with the minimisation of transition spaces (*Fig. 18-21*).

Equally important were the properties of the spatial configuration, high lightened by the Space Syntax analysis of the convex diagrams. The dimensions of the original built form were designed so as to suffice for a two-rooms depth and a one-room plus the stairs width, in order to assure ventilation and lighting qualities. In *Figures 19, 24* it is shown how the produced symmetry of the plan has created equally integrated convex spaces facing both the front and the rear of the dwelling for each floor (both for the old and new interior plan). This enabled a symmetrical distribution of inhabitants in the new apartment units, which were mirrored along a central axis that divided the floor in two sides (*Fig. 21, 22, 25*).

The interior/functional alterations imprinted also in the façade, with the stoop removal and the aesthetical demarcation of the basement (which implied at the time the distinction of the commercial use from the residential above) changed the entire building front and gave a more public character to the interface with the street (p.163); on the one hand residences were accessed through a shared entrance that was now closer to the street level, and on the other hand the shop occupancy at the basement level created for the 39 Grove Street a more 'social' configuration.



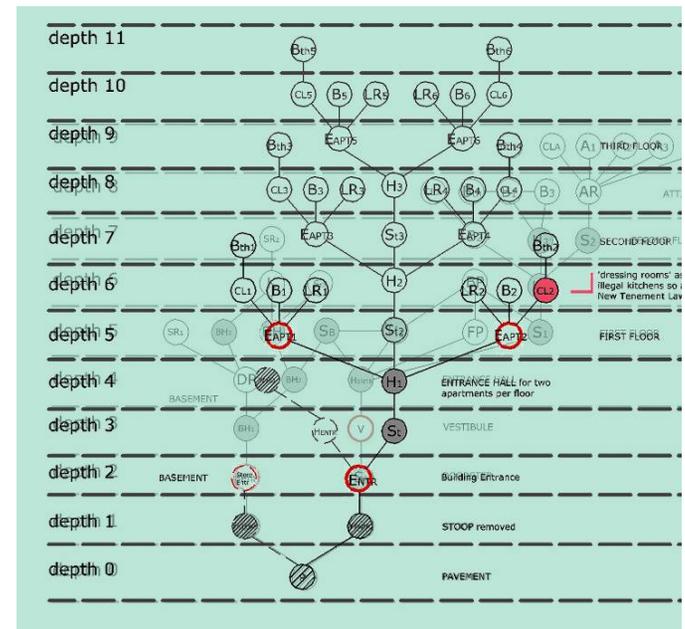
Photos. No 39 Grove Street: Current building façade
Left: the pavement configuration in the block of 39 Grove Street
Right: The dwelling entrance and its relation to the neighbouring building entrance

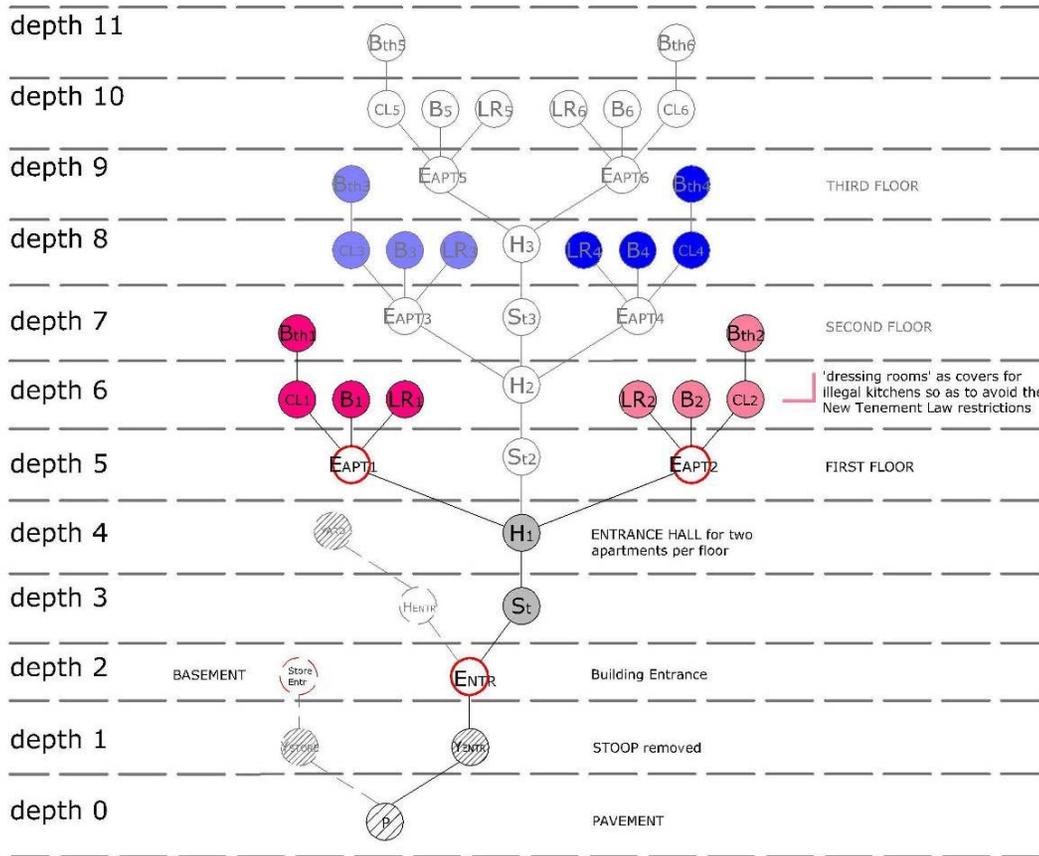


Figures 18, 19, 20. Building No 39 Grove Street
 Left, above: The old building; (starting from the left) the basement, first fl second floor and attic floor plans.

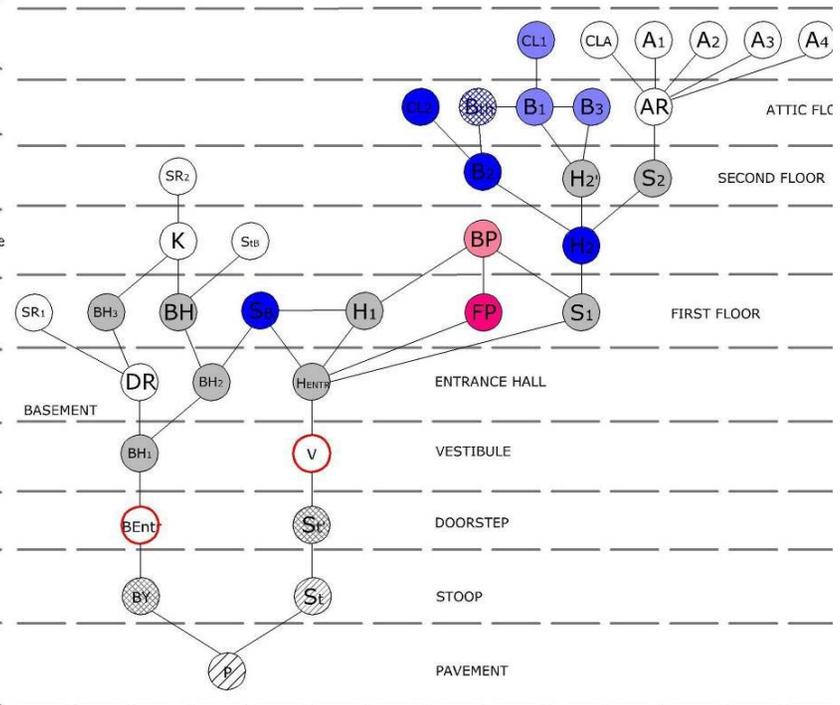
Left, below: After the 1920's alterations; starting from the left: basement ground floor plan. Right: Space Syntax integration values for the convex spa the configuration (for the two apartments on the first floor).

Right, below: the old (fading background) and the new justified-graph representations superimposed. The residence entrance is highlighted in r Occupancy spaces are marked as dots and entrances as links. The graph begin the pavement to represent the depth of the house in relation to the stre





Figures 21, 22. Building No 39 Grove Street: The old (left) and the new (right) justified-gi representations. The residence entrance is highlighted in red, and transition spaces are grey. The difference in colours between the two graphs shows the transformation that the space has undergone in the conversion to new use.



Here, it is interesting to observe how single rooms from the old configuration have been turned into whole apartments in the new interior organisation. For instance, the front and back parlour in the first floor became respectively the first and second apartment in the new floor plan.

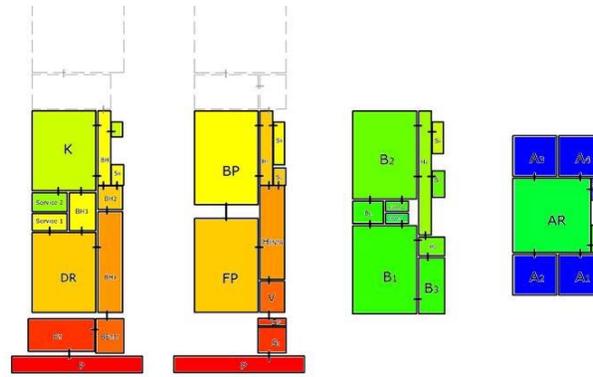
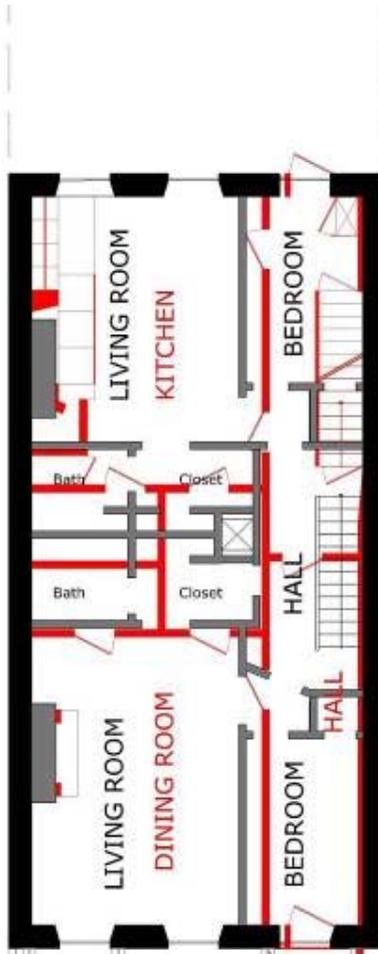


Figure 23. No 39 Grove Street: Old configuration
 Step Depth from the street domain

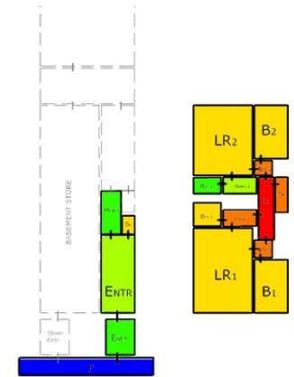


Figure 24. No 39 Grove Street: New configuration
 Step Depth from the floor entrance hall, symmetrical relation created apartments

Figure 25. Building No 39 Grove Street: The apartment conversion
 Underneath (and in red) the old basement plan with the symmetrical arrangement of rooms; the arrangement of the basement became a template for the also symmetrical organisation of the apartments (partitions coloured in grey) in the converted upper floor, in 1920s.

4 – ADDRESSING THE INTERACTION OF URBAN SCALES IN HOUSING DESIGN

This paper has been an effort to study historic housing transformations in reference to the external spatial forces (and consequently social as well) that might have shaped the evolution of housing typologies, aside from the purely architectural and functional factors that refer to the building per se. In other words, domestic space has been correlated to the street configuration of its surroundings, whilst emphasising the intermediary spatial locations where the two scales overlap; namely examining the role of boundaries in shaping the relation between these two socio-spatial scales.

The aim was to compose a cross scale study, thus the analysis and representation tools touched upon both the building and the street domain, passing from the urban area, the urban block scale and the finally ending in the domestic interior. As the aim was to focus on the potential role of spatial boundaries in constituting social interfaces, the social functioning of the local scale was recorded through the study of land uses, and related to the grid transformations of the greater Manhattan district. The character of boundaries (primary or secondary) between domestic entrance and neighbourhood space/street was also recorded and studied in reference to the levels of 'constitutedness' they present and the formed 'interface maps'. Finally the selection of the row housing typology was not accidental. Firstly, row houses were for the studied area the most common residential unit, which started as a single-family space and converted into apartment studios over time.

In this particular study, it was shown how the forces that shaped the built form over time, transformed the street façade so as to construct compatible interfaces with the evolving urbanisation. The requirement that forced densities to be hosted in the same built shell, so as to preserve the human scale and neighbourhood qualities of the historic settlement, seemed to have open up the ground floor to more interaction, so as to manage to host both residential and more urbanised land uses. It might be the case, as discussed, that the fact that although transformations in the area performed as a movement, the redevelopment was mainly privately initiated, and thus maintained architectural individuality of the buildings. These differentiations, along with the maintenance of the human scale in the more internal residential parts created different and lively street profiles. It is argued that the underlying template of a defined and rhythmical grid structure that extends to each one of the studied scales, created a flexible background that kept the transformations still organised and unified in a spatial system. In this case, different - and perhaps often in 'conflict' - uses seem to be working in interaction through the building-street boundary performance.

As Hanson and Hillier explain (1987, p.271) - in a paper that argues that both 'hierarchical' and 'probabilistic' systems should be included, decomposed and understood when considering cities - while hierarchical relations are easy to be followed and reproduced, "*the nub of the problem seems to be how it is possible to have spatial order without hierarchy*". Thus, attention is given to the relation of the parts to the whole. In the paper, it is suggested that when called to design in a probabilistic way, what planning propositions are lacking of is a bottom-up approach, whose processes of configuring the part are underpinned by a constant reference to the whole system and not by a limited localised perception of the immediate environment. Furthermore, for the case of a probabilistic scheme, this does not imply that the part should be in 'correspondence' with the whole, but on the contrary, the part is called to work based on structured 'non-correspondences'. As argued by the authors, the last increase the potential for diversity and complex interrelations within the system. This last argument raises also discussions concerning the consideration of 'conflict' as a formative agent of interesting urban phenomena (Bobic, 2004; Harvey, 2001; Sennett, 1974). As Bobic puts it (2004, p. 65), "*conflict is not a static situation but the starting point of a dynamic process*" in which 'heterogeneity' (Alexander, 1966; Jacobs, 1961) and 'non-correspondences' (Hanson & Hillier, 1987) constitute the core of 'urbanity'.

REFERENCES

- Anon.** (1920) Color in the City Streets In *American Architect*, vol. 118, p. 146
- Alexander C.** (2005) *The Nature of Order: An Essay on the Art of Building and the Nature of The Universe. Book One: A Vision of a Living World.* Berkley: The Center for Environmental Structure
- Alexander C.** (2002a) *The Nature of Order: An Essay on the Art of Building and the Nature of The Universe. Book Two: The Process of Creating Life.* Berkley: The Center for Environmental Structure.
- Alexander C.** (2002b) *The Nature of Order: An Essay on the Art of Building and the Nature of The Universe. Book One: The Phenomenon of Life.* Berkley: The Center for Environmental Structure.
- Alexander C.** (1979) *The Timeless Way of Building.* New York, Oxford University Press
- Alexander C.** (1966) A City is not a tree. In *Design*, 206 p.46-55
- Batty M., Marshall S.** (2009) The Evolution of Cities: Geddes, Abercrombie and the new physicalism. *TPR* 80 (6)
- Bobic M.** (2004) *Between the Edges, Street-building transition as urbanity interface.* THOTH Publishers
- Dolkart A.** (2009) *The Row House reborn.* Baltimore, The John Hopkins University Press.
- Griffiths S., Jones, C. E., Vaughan, L. and Haklay, M.** (2010) 'The persistence of suburban centres in Greater London: combining Conzenian and space syntax approaches'. In *Urban Morphology*, 14 (2), p.85-99
- Hanson J.** (2000) Urban transformations: a history of design ideas. In *Urban design international*, 5 (2), p. 97-122
- Hanson J., Zako R.** (2007) Communities of co-presence and surveillance: how public open space shapes awareness and behaviour in residential developments. In the *Sixth International Space Syntax Symposium*, Istanbul, Turkey
- Hanson J., Hillier B.** (1987), *The Architecture of Community, Architecture and Behaviour*, 3, p. 249-273
- Harvey D.** (2001) *Spaces of Capital: Towards a Critical Geography.* New York, Routledge.
- Hillier B.** (2002) A theory of the city as object: or, how spatial laws mediate the social construction of urban space. In *Building Design International*, vol. 7, p. 153-179
- Hillier B.** (1992) Look Back to London. In *Architects Journal* 195 (15), 42-46.
- Hillier B., Hanson J.** (1984) *The Social Logic of Space*, Cambridge University Press
- Hillier B., Vaughan L.** (2007) The City as One Thing. *Progress in Planning*, 67 (3), p. 205-230.
- Hillier B., Turner T., Yang T., Park H.** (2007) Metric and Topo-geometric Properties of Urban Street Networks: Some Convergences, Divergences and New Results. In the *Sixth International Space Syntax Symposium*, Istanbul, Turkey
- Jacobs J.** (1961) *The Death and Life of Great American Cities*, Harmondsworth, Middlesex, Penguin, Chapter 22
- Lockwood C.** (1972) *Bricks & Brownstone.* New York, Abbeville Press.

Newman O. (1981) *Community of interest*, Doubleday & Co Inc

Newman O. (1972) *Defensible Space: Crime Prevention Through Urban Design*, The Macmillan Company

Marshall S. (2009) *Cities, Design & Evolution*, Routledge

Samuels I., Panerai P., Castex J. and Depaule JC (2004) *Urban Forms: The Death and Life of the Urban Block*, Architectural Press London

Sennett R. (1974) *The Fall of Public Man*. New York, W. W. Norton Co. Inc.

Yang T., Hillier B. (2007) *The Fuzzy Boundary: The Spatial Definition of Urban Areas*. In the *Sixth International Space Syntax Symposium*, Istanbul, Turkey

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