

The Journal of Space Syntax



architecture

urbanism

society

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Pages: 73-96

The Journal of Space Syntax

ISSN: 2044-7507

Year: 2011.

Volume: 2, Issue: 1

Online Publication Date:

26 August 2010

<http://www.journalofspacesyntax.org/>

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This paper proposes that Hillier and Hanson's thought on society and space has wider implications for social theory in general and for applied historical research in particular than has previously been acknowledged. This epistemological isolation can, to an extent, be explained pragmatically by the inevitable difficulties of inter-disciplinary translation of historical research conducted in space syntax mode. However, the principle concern of this paper is to explore a more fundamental, theoretical, reason why researchers in the historical disciplines can struggle to engage with Hillier and Hanson's work: namely the marginalization of temporality in the 'theory of spatial description' that is the conceptual foundation of the space syntax theory. The claim is not that time has been altogether ignored; on the contrary the temporal nature of reality figures largely in the theory. Rather, the argument here is that this aspect of the theory has, in practice, been deliberately subordinated to the overriding task of articulating a formal morphological grammar of social organization. Perhaps inevitably this emphasis has focused attention on the synchronic structure of space, to which notions of temporality remained essentially external. However, it is equally clear that this emphasis has come at the cost of introducing some inconsistencies in the underlying theoretical proposition of spatial description. The consequence, it is claimed, has been to amplify the difficulty in using Hillier and Hanson to articulate temporality in space. This difficulty raises issues not only for those with a particular concern in built environment history but, more generally, with anyone concerned to understand the complex relationship of architectural space to how people live. Through a critical review of space syntax theory and its intellectual antecedents in the light of what could be termed the 'temporal turn' in the physical sciences, this paper makes the case for *time-space descriptions* as a natural development of Hillier and Hanson's theory of spatial description that is necessary if space syntax research wishes to extend its engagement with the historical disciplines.

Keywords: Space, Time, Space syntax, History, Urban morphology

1. Introduction

The starting point for this critique of Hillier and Hanson's theory of spatial description (Hillier and Hanson, 1984) is the author's experience of applying space syntax methods to archive-based historical research into a single urban community (Griffiths, 2005; 2008; 2009). The reason for adopting a space syntax approach lay in the possibility of critically examining propositions relating to the social significance of changes in what Penn (2003a) has called the 'shape of inhabitable space', during a rapid phase of urbanization in Sheffield, an English industrial city c.1750-1900. The application of space syntax methods to cartographic sources helped to provide descriptions of spatial form that are

relatively inaccessible to conventional language. This inaccessibility lies in what Hillier (1996 *passim*) argues is the 'non-discursive' nature of architectural space as an entity understood intuitively by actors situated in time-space but which rarely becomes the object of critical reflection. However, the advantages of deploying space syntax methodology in historical research also raised a number of issues of disciplinary translation - particularly regarding the temporality of spatial description - which form the principal subject matter of this paper.

It is not necessary (though it is quite possible) to contest Giddens' (1984: 355-68) reluctance to assign any epistemological distinctiveness to historian's particular claims on time and the past, in order to acknowledge the *de facto* differences in the way historians and social scientists practise their disciplines. In this respect a key issue for an historian using space syntax arises from considering how far generalizations pertaining to the social logic of spatial configuration can be meaningfully embedded in historical narratives that serve, in the first instance, to give a coherent account of a particular period in the past, rather than to test the validity of a theoretical proposition. The danger is that the complex interpenetration of processes of change and continuity within historical communities that are the core concern of urban historians risk being spatialized as static socio-spatial 'objects', allowing the multifaceted nature of a city's history to be pressed into service as a simple 'placeholder' subsumed into a comprehensive theorization of socio-spatial evolution. While such objects can equally be used to identify diachronic processes, the tendency to suppress temporal presence creates a potential source of historical anachronism. Such a concern naturally focuses attention on what Hanson (1998: 78) has referred to as the "problem of ambiguity" in the interpretation of human life in space - a problem that she acknowledges as a source of experiential liberation. The implication of the arguments presented in this paper is that the temporality implicit in the ambiguity of space should be embraced by space syntax theory as central to its interpretative or hermeneutic 'liberation' rather than being treated as problematic. Historians themselves can only benefit from deploying space syntax theory and methodology in their exegesis of historical built environments.

Space syntax research has, of course, a long and distinguished record of historical research pioneered by the work of Hanson (1989a; 1989b; 1998; 2000)¹. A recurrent theme has been the understanding of the evolution of settlement morphologies within a broad national and international historical context (Medeiros *et al*, 2003; Medeiros and de Holanda, 2005; Medeiros and de Holanda, 2007 and Medeiros *et al*, 2009; Shpuza, 2009; Pinho and Oliveira, 2009). Syntactical morphological histories by Read (2000), Karimi (2000) and Azimzadeh and colleagues (2001; 2003; 2005; 2007) among others, have demonstrated the value of approaching the urban fabric as an historically layered 'palimpsest' with observable effects on patterns of movement and occupation; often with a focus on vitality of historical urban cores (Trigueiro and Medeiros, 2007; Perdikogianni, 2003). A third theme explores the extent to which urban form serves to materialize and mediate socio-economic differentiation and status (Vaughan and Penn, 2006; Vaughan *et al*, 2005; Zhu, 2004; de Holanda, 2000). Clearly, research in space syntax has heeded Hillier's (1973: 543) warning and not 'rejected history'. He was referring to a particular episode in the architectural history of British social housing when successive architectural schemes demonstrated a lack of awareness of the flawed assumptions that

informed their design - with unfortunate consequences for society. By contrast, the question raised in this paper is the extent to which historical research employing space syntax may find itself limited - for better or worse - by those aspects of the theory of spatial description that have tended to the suppression of temporality.

In broad terms, the debate about spatial description in space syntax theory could be regarded as a question of epistemology. As Psarra (2010) has argued: space syntax theory has difficulty with contextual explanation - not least because it challenges its privileged explanatory domain of space as a 'non-discursive' realm. However, there is an irony here since, in a pragmatic sense, space syntax is able to provide a convincing 'context' of inhabited-space description where none would otherwise have been available. The concern of this paper is less with epistemology *per se* than with the time-space *ontology* proposed by Hillier and Hanson's theory of spatial description. Nevertheless, it is probably true to say that the desirability of extracting a rather more contextual theory of description from a principally comparative one is an implication of the theoretical position advanced here. The first part of this paper presents a critique of Hillier and Hanson's theory of spatial description, arguing that the temporality that is an intrinsic part of the descriptive mode of space syntax has been marginalized by a preference for research in the synchronic mode of analysis. In the second part the possibility that space syntax analysis provides 'time-space descriptions' is illustrated by a simple configurational thought experiment. The third and final part draws out some broader theoretical implications for the theory of spatial description in the light of developments in the physical sciences. The paper concludes with some thoughts on the possibility of developing an improved discourse of historical time-space grounded in space syntax theory.

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2. The theory of description retrieval and the marginalization of temporal description

Gellner (1989: 514) has defined 'culture' as whatever is transmitted 'non-genetically' in order to sustain a community over time. In some respects his definition of culture is very close to Hillier and Hanson's (1984) conception of society, in the sense that it is not to be regarded as arising from innate qualities of the human condition (or the human genotype) but from the fact that a particular form of social organization in the material world (its 'spatial culture') has successfully sustained that society it over time. It follows that descriptions that were less successful are less likely to have been transmitted. Hillier and Hanson locate the descriptions essential for the reproduction of social organization in the time-space materialization of society itself (*ibid.*: 201-203). In this respect their theory of description retrieval is in many ways a useful contribution to a broader theory of material culture. This emphasis on materialization is typically associated with the built environment understood in the broadest architectural sense as the field of 'inhabited space'. This characteristic emphasis on 'descriptions' as being embedded in the world derives from Hillier and Hanson's critique of Lévi Strauss' structuralism. For Hillier and Hanson (in 1984 at least) it is as inadequate to theorize society as the aggregation of human minds as it is to theorize it as a mere reflection of innate cognitive structures. With an emphasis that Latour (2005) would approve of, they argue that society is not something that simply is but it is something that is *done* - one might even say 'performed'.

The nature of this performance is what Hillier and Hanson call 'description retrieval' by human agents situated in time and space. What is being retrieved is essentially the configurational description of relations that structure social encounter. These descriptions are both 'spatial' (in the sense that the form of inhabited space has a probabilistic effect on patterns of encounter) and social (in the sense that societies impose rules onto space that may become encoded into the spatial form itself). In space syntax theory the first set of descriptions are regarded as 'non-discursive', meaning that they employ a 'morphic language' or space syntax which we understand intuitively rather than reflectively; the second set of descriptions are discursive social conventions that pertain both to social relations in space and across space. A key aspect of space syntax theory is that all societies are a combination of both spatial and 'transpatial' relations - hence the proposition that the activity of description retrieval is essential to sustaining the idea of the spatial community across space and time (Hillier and Netto, 2002).

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Hillier and Hanson (1984: 42-45) theorize spatial descriptions in informational terms as 'inverted genotypes'. This conceit refers to the fact that a society has no centralized information source, such as is present in the DNA of living organisms (and more vaguely in functionalist organic analogies), and that its information must therefore be discretely (or transpatially) embedded in the material reality of a society. The act of description retrieval, therefore, enables individuals who are circumscribed in time and space to access the abstraction of 'society' through their relatively localized experience. This idea is illustrated with the example of the midge swarm. Through the ability to retrieve some simple localized rules of relation (basically avoid bumping into other midges) a single midge is able to maintain the reality of the 'swarm' object without any need for an 'innate' description of 'swarm' *per se*. At the same time the swarm does not exist eternally (i.e. outside of time); its continuing existence depends on the midges for the maintenance of structural stability above the threshold where it could be destroyed by external perturbation (heavy rain for example).

There are two notable aspects of Hillier and Hanson's theory of spatial description that have been neglected in its subsequent development. The first of these is the fundamental *contingency* of the inverted genotype when compared to the organic equivalent. This is made explicit in their comment that the description 'must be constantly re-embodied in social action if it is not to vanish or mutate' (*ibid*: 45). It follows that, unlike a biological genotype the inverted genotype 'while being generally stable, can...establish radical discontinuities in its history' (*ibid*: 44). The second, related, aspect is the fundamental temporality of the acts of description retrieval *and renewal* - both activities must be continually performed by human agents participating in the time-space reality of social life. With this emphasis the theory of description retrieval provides a conceptual framework for examining not only the persistence, disappearance and mutation of societies at the systemic level, but also for a whole research agenda aimed at understanding how social descriptions become embedded, displaced, managed and eroded in the material realm.

Yet, the potential for structural instability in social organization implied by the inverted genotype notwithstanding, it is notable that the emphasis in space syntax theory since the *Social Logic of Space* has been with invariant and genotypical descriptions of social organization through comparative analysis. By contrast, there has been a lack of interest in understanding those processes of mutation, adaptation and disappearance, which make greater demands on understanding the historical particularities of time-space, but which the inverted genotype model nonetheless implies. In fact structural invariance in urban systems should not even be equated with historical continuity, which as the theory of spatial description establishes, is something that cannot simply be assumed but must be performed - continuity still implies change of a kind. Where societies experience perturbation (whether from an internal or external source) the descriptions of that society that are materially embedded, its 'inverted genotype' will need to adapt - an ongoing dynamic of description retrieval and renewal that should not be glossed over lightly in the pursuit of more universal spatial laws (Hillier, 1996). In Thrift's (1983) terminology, such an emphasis has the effect of marginalizing the descriptive-contextual potential of space syntax theory in preference for the analytic-'compositional' explanation. The risk is that, rather than producing analytical rigour the range of phenomena considered by space syntax research falls into a diminishing range of categories less likely to challenge and develop the core propositions of the theory.

The most notable casualty of a preference for invariant structures as modes of explanation in space syntax analysis is time; specifically, the temporality present in the theory of spatial description. In fact such a tension between the temporal and spatial is evident even in the core theory. While the renewal and retrieval of spatial descriptions is said to take place in the time-space materialization of society - somehow the resulting 'meta-description' of society - the genotypical spatial 'object' - is entirely synchronic; hence Hillier and Hanson refer to 'spatial description' and not 'time-space description'. The surprising elision betrays the inadequate theorization of time in the theory of spatial description. The unremarked shift from time-space description in the material realm to a synchronic meta-description of society as the abstraction of the materialized social object is a fundamentally problematic aspect of the theory, at least so far as it can be applicable to research in the historical disciplines.

Hillier and Hanson are, nonetheless clear why time should be suppressed. They argue that society's inverted genotype (i.e. its discrete descriptions of social relations) tends to 'conserve the present and have no regard for the past'; unlike a biological system, it has no 'genetic memory' (Hillier and Hanson, 1984: 44). They mean by this that the evolutionary process of statistical selection that produces complex emergent systems such as a 'society-in-space' is essentially 'irreversible' in that information about past states is lost and cannot be recovered (for example by running the process backwards, if it were possible). It follows that the system at any given moment is a 'complete' description of itself and that future transformations cannot be predicted - a characterization of a system that can be described mathematically by a Markov process (Prigogine and Stengers, 1984: 236).

Yet, from an historical viewpoint, such a characterization of society's inverted genotype as 'memoryless' seems crudely inconsistent with a long tradition of morphological research into landscapes (both urban and rural) as palimpsests (Hoskins, 2006 {original 1955}; Tilley, 1994; Martin, 1968); a notion which certainly has structural resonances - not least in space syntax theory - see Azimzadeh and Bjur (2007) but one in which the temporality of the built environment is acknowledged as intrinsic rather than externally imposed through crude periodization. It is of interest in this context that Hanson herself commented in her PhD thesis (completed six years after the publication of the *Social Logic of Space* and a mature work) that:

'An urban grid is, it seems, a source of historic "memory"... [it can] conserve principles of urban form and structure in that it is a large accumulation of syntactic events'
(Hanson, 1989a: 396)

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There is clearly a tension between Hanson's two statements regarding spatial configuration as a vessel for the negation *and* presence of memory; one focusing on the synchronic properties of a spatial description, the other focusing on its diachronic or 'time-space' properties. The inconsistency points to the existence of a non-trivial distinction between the two contexts in which Hanson was writing. In the *Social Logic of Space* elucidating the theory of spatial description assumed a privileged observer entirely external to the system, which can, therefore, be described in structural terms as a complete object, but in which the internal history of the system is, reciprocally, suppressed. In her PhD thesis by contrast, the purpose was somewhat different - to relate the history of morphology to the history of events (*ibid*: 395). Such an endeavour requires a heightened sensitivity to the internal history of the system in which the morphological historian is required to ascertain what Hanson refers to as 'submerged' descriptions of change and continuity (*ibid*). The position of the observer (researcher) here has subtly shifted. Whereas the observer-as-analyst positions himself/herself at an absolute viewpoint beyond the system (i.e. outside time) in order to grasp its entirety, the observer-as-historian positions himself/herself relative to the object being studied (i.e. within time) in order to identify the grain of the 'history of events', which are (in effect) inseparable from the internal history of the system itself. The theoretical incommensurability between these two observer perspectives suggests how the question of whether the history of events inscribes some kind of configurational 'memory' into spatial descriptions have remained largely unexamined and unresolved in space syntax research. Yet, addressing this question is of vital importance if the methodology is to be accessible to the historical disciplines. Note that what is at issue here is not 'memory' as the exclusive domain of an individual *per se*, but memory - or at least descriptions - that are available exsomatically-collectively. Understanding the historicity of spatial descriptions in this sense could assist the understanding not simply of the mechanics of 'cultural transmission' but also, more pertinently, as Connerton (1989) puts it in his monograph on ritual practices, 'how societies remember'.

On the whole, the mainstream of space syntax research has been conducted from the point of view of the privileged observer, who is more concerned with synchronic spatial description than with its temporality. In most respects such a perspective reflects the legitimate concerns of space syntax researchers, whose primary aim is not historical authenticity, and who might be concerned that in particular research contexts the acknowledgement of observer-relativity would undermine the objectivity of research (though it will be argued in other research contexts that the acknowledgement of relativity promises far richer descriptions). Nevertheless, despite these legitimate concerns, it remains the case that space syntax theory has struggled to systematically address questions of time and this is a general problem. Three reasons drawn from the intellectual genealogy of space syntax are presented here.

First, is the lingering presence of a Newtonian universe in which time past, present and future are interchangeable in the sense of a well-oiled machine that runs equally well forward or backwards. Space syntax theory certainly does not espouse such a Newtonian perspective on time (Hillier and Leaman, 1973). They are quite clear in arguing that the 'paradigm of the machine' echoes the purely subjectivist paradigm in comprising 'two mutually exclusive epistemologies talking past each other' (1973: 508). The authors' preference for relational epistemologies such as the theory of spatial configuration derives from exactly this observation. Having said this, it is true that Hillier (1996: 392-3) borrows from Newton the idea of human movement in space as being analogous to Newtonian inertia and as predictable according to the laws of spatial configuration, all things being equal. There are two problems here: firstly all things are not equal; movement takes place in an environment in which an historical series of initial conditions (socio-economic, topographical etc) has already constructed the field. In practical research terms this does not need to matter - Newton's mechanics still hold good in most cases after all. However, theoretically it *does* matter because, in order to identify strong predictive correlations between movement and the configuration it is first necessary to assume the position of the privileged observer, in which variables can be tightly controlled. In effect, this means privileging particular scales of movement - typically those equivalent to the urban or building scale, as being more important than others. Movement at much smaller or much larger scales are shoehorned within this preferred analytical frame of time-space. One could fairly argue that space syntax theory has innovated in providing a profound critique of homogenous Euclidean-Newtonian space, and replacing it with a relativistic configurational model, in which positionality within the descriptive field is everything. However the mechanistic, Newtonian view of *time* has been left substantially intact since the time-space frame (or spatial 'snapshot') selected by privileged observer remains authoritative. This under-developed temporal ontology risks trapping the syntactic theory of natural movement (Hillier *et al*, 1993) in the Newtonian paradigm, despite its best intentions.

The second reason for the suppression of time in the theory of spatial description lies in its intellectual antecedents in the linguistic structuralism of de Saussure and the structural anthropology of Lévi Strauss (Hillier and Leaman, 1973; Hillier and Hanson, 1984; Hanson and Hillier, 1987). The

reason for this is clear: structuralism offered Hillier a way out of dualities of the 'Man Environment Paradigm' by proposing a relational perspective in which individual agents came to know the world through their predisposition to make sense of discrete social phenomena. On this basis, the configuration of the built environment could be said to possess a 'social logic' irreducible either to the subjective experience of individual actors, or to mechanistic abstraction, but was instead retrievable through experience of the time-space reality of the material world. To the objection that it not actually clear where the structures themselves exist, Hillier responds by drawing on Popper's Platonic notion that the human intellect works with ideal models of reality (abstractions) through which reality became meaningful (Hillier, 1996: 419). In this sense, relational structures can become objects of theoretical and empirical study.

As Massey (2005: 39) has pointed out: the difficulty with the structuralist proposition is that they tend to separate space - 'the stasis of a synchronic structure' - from time as history. This separation lends itself to synchronic space being described in terms of a 'closed-system' - that is in a static time-space frame selected by the observer and perhaps mistakenly assumed to be the 'natural' one - in which universal spatial invariants are opposed to historical temporal variants. The argument proposed here is that a revised theory of spatial description premised on a notion of spatial configuration conceived as a dynamic open system would not only yield richer descriptions, but also advance the theoretical dialogue with post-structural social theory which, in principle, advocates a basically compatible, relational ontology of the social as 'network' (Deleuze and Guattari, 1976; Deleuze, 1999; Thrift, 2008). At present there is a tension in space syntax theory between the emergent possibilities of 'configuration' and the structuralist residue of 'invariance', that is unsatisfactorily resolved by the privileging of the external time of the observer.

Another danger with structuralism is that the research can retreat from time-space reality to find its correlate in particular mental processes. Hillier and Hanson themselves (1984: 4-5) critiqued Levi Strauss's tendency to see space as a simple mental projection. Of course, space syntax theory does not set out to reduce space to a mental projection, but there is a sense in which a 'cognitive turn' in the discipline (Hillier, 2003; Penn, 2003a; 2003b; Hölscher *et al*, 2006) opens it to similar criticism. This space syntax of spatial cognition has produced a range of valuable research focused on the individual experience of navigating environments. However, from a theoretical perspective, such a research direction can seem like an attempt to validate the formal tenets of space syntax analysis in cognitive-neuroscience terms, an aspiration, which comes dangerously close to a search for essentialist 'hardwiring'; not simply in the sense of a neurological description retrieving capability, but more fundamentally in the sense of the descriptions themselves becoming rendered intrinsic and universal.

Hillier does not see a difficulty here. By stripping out any notion of historical particularity, he can advance to fundamental reasons that explain how humans are able to find intelligibility in built form. Consequently, his synchronic model posits a 'generalised individual' who is 'located at all points in time and space', and whose cognition of the invariant structures of urban form effectively embodies

the syntax of those structures in a kind of cognitive mirror image (Hillier, 2003: 1.16). However, despite his or her earthly location, the omnipresence of Hillier's 'generalized individual' does strongly imply super-human, if not God-like, qualities, that would facilitate a complete synchronic knowledge of inhabited space in a manner that seems extremely unlikely in any actual individual. Wheeler has argued, from a cognitive science perspective, that 'the phenomenon of understanding is an ongoing series of historically embedded events' which is impossible to separate from the understander's position in socio-cultural history (Wheeler, 1996: 211-212). Hillier's generalized individual seems to embody society so thoroughly that the possibility of a meaningful concept of 'retrieval and renewal' in description is effectively eliminated and temporality further repressed. Just as Heidegger (1993 {original 1959}) maintains that the historical nature of language means it cannot be reduced (in its social essence) to 'information', so spatial intelligibility in time-space reality should not be similarly reduced to ahistorical cognitive predispositions and description retrieval to purely synchronic descriptions.

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The third reason why space syntax theory has suppressed time has to do with the way it draws upon Darwinian theory (Hillier, 1996: 384-395). This might seem surprising since evolution is a fundamentally temporal process. However, the nature of this temporality is rendered such that it has remained largely marginal to the theory of spatial description. For Hillier natural selection by random variation provides the mechanism for why certain modes (descriptions) of social organization in space persist more than others. From a built environment perspective, those descriptions endure which are the most probabilistic in terms of their form (space syntax theory would distinguish generically between possible and impossible forms) given the social logic that they, in some sense, encoded.

From the point of view of historical research, there are two difficulties with the conceptualization of evolutionary time in space syntax theory. Firstly, time remains largely external to the evolutionary model in the sense that the functional 'fit' between the society and the spatial description - as presented in most of the historical and anthropological examples in Hillier and Hanson (1984) and Hillier (1996) - is so absolute that the temporality internal to the society itself is effectively flattened. Yet as Geertz (1973: 162-169) shows in his study of a funeral ritual in a small Javanese town, 'social descriptions' in terms of cultural practices that carry meaning for the inhabitants can become strongly divergent from the historical socio-economic realities of their wider society. Secondly, there is a marked preference in Hillier's thought for what he regards as the probabilistic path of social evolution rather than the less probabilistic ones. Hillier (1996: 215-238) makes a fundamental distinction between the symbolic axial descriptions of what he calls 'strange towns' such as Teotihuacan and Brasilia - and the 'instrumental' axiality of more common urban forms. The difficulty here is less with the analysis itself than with the way in which the idea of 'strange towns' sets up a binary distinction with 'normal' ones. The emphasis on 'strange cities' endorses an evolutionary pathway of urban form that is largely predictable on the basis of structural invariants. Such an account begins to look distinctively teleological - the strong emphasis on the selection of descriptions by random variation notwithstanding. The essential contingency of spatial description is quite clear in the *Social Logic of*

Space, but seems to have diminished with Hillier's subsequent theoretical development of space syntax. A truly historical sense of time would emphasize the contingency of evolution, and be highly sceptical of what the past can tell us about the future.

3. From spatial description to time-space description retrieval

It has been proposed that the temporality of spatial descriptions that is implicit in the original theory has been suppressed *de facto* by a strongly synchronic emphasis on formal syntactic description, and insistence on the privileged position of the observer that has remained largely unchallenged. This emphasis on synchrony is associated with what Prigogine and Stengers (1984: 37-40) refer to as the 'Newtonian synthesis', in which the complex 'messiness' of matter-in-time was effectively externalized into a predictable mechanistic framework in order to facilitate the development of a new science capable of providing universal cosmological explanation in a manner parallel to divine revelation. However, it is now widely accepted that the conditions of life on earth are improbable as well as irreversible in time, and characterized by non-equilibrium systems on the 'edge of chaos' (Prigogine, 1980; Prigogine and Stengers, 1984; Prigogine, 1985; Nicolis and Prigogine, 1977). From the perspective of a non-privileged or 'embedded' observer, this means the organizational dynamic of the material world is one of time-in-space; time and space, while not being irreducible to each other, cannot be completely separated either; both are needed if the complex dynamics of motion are to be described (Ridley, 1995: 69). Prigogine and Stengers (1984: 17) argue that the paradigm shift represented by the second law of thermodynamics and general relativity means that science can no longer 'spatialize time'. Interestingly, they use a historical-geographical example to illustrate their point:

'.....now we discover that another view is possible. Consider a landscape and its evolution: villages grow, bridges and roads connect different regions and transform them. Space thus acquires a temporal dimension;.....we have been led to study the "timing of space"². (*ibid.*)

In the material world in which descriptions are renewed and retrieved it makes sense, therefore, to consider whether a spatial description should be a *time-space* description. This is explicitly not an assertion of individual perception of time in a psychological sense; rather it is to suggest that, as Prigogine (1985: 18) has stated, time has entered into the 'basic descriptions of matter'. It follows that where no time-space reference can be considered privileged, it makes sense also to reconsider whether the spatial configuration of the social should not be reconceived as a *time-space* configuration in which temporal as well as spatial positioning is understood to be relative. This section explores these ideas by returning to some of the elementary principles of spatial description in space syntax theory.

3.a. Time-space descriptions - an illustrated thought experiment

In the *Social Logic of Space* Hillier and Hanson (1984: 33-36) demonstrate how configurational objects can be the emergent outcome of a local random generative process. For example, a few simple rules of local building aggregation may produce a system characterized by terrace or courtyard-like arrangements of buildings. This works because 'rules' of aggregation are retrieved locally as descriptions that give rise to well-defined structures valid at the systemic level. In this way, time-space activity in the material world conserves the abstract (configurational level) description over time. It has already been mentioned why, according to Hillier and Hanson the history of time-space activity is, to all intents and purposes, erased at the level of the systemic (society-level) description. It has been argued that this aspect of their thinking derives from the strongly cognitive-structuralist basis of space syntax theory in which an uncritical acceptance of the privileged position of the observer has led to a fundamentally ahistorical perspective on configurational structures.

Returning to Hillier and Hanson's basic generative model some *prima-facie* observations can be made even here, which suggest how the model might be re-evaluated if the observer's privileged position was put to one side. In other words, if it were considered how a configurational description may appear 'from the inside'; how temporality might be manifested as part of the description that is retrieved. The diagrams in Figure 1 (a-f) are effectively, illustrations of a configurational thought experiment. They are intended for explanatory purposes and do not comprise a formal computational model. They show the location of forty-three square tablets (representing buildings) dropped onto a board from a height of about six inches in order to ensure a degree of randomness in distribution. Each of the four shades of grey represents a distinctive, non-defined historical 'epoch' of building activity. Each drop was offset a little from the previous one to suggest that such activity represented a continuation over an extended geographical area. Hillier and Hanson's (1984: 35) generative rules have been followed loosely such that it is a requirement that each cell needs to open onto open space on at least one side (or be redropped), and a process of manual aggregation between each drop requires that individual tablets along one side be aligned where they are already in 'near' or 'proximate' alignment. This process was not restricted to the additional tablets since each drop created a disturbance to the previous arrangement indicative of churn during ongoing development. The interface between each tablet and open space is indicated by a black dot to give a sense of how space open is 'constituted' by thresholds to buildings. Where, following the initial drop, the side with the black dot did not open to public space, the tablet was rotated clockwise until it did so.

Unlike Hillier and Hanson's model, single tablets and tablets with vertex joins were permitted. Epochs 5 and 6 represent phases of consolidation and stability where no new tablets were added but minor interventions were made to aggregate unattached tablets and improbable vertex joins (Epoch 5). Finally a 'monument' was added in an area of open space (Epoch 6) indicative of the mature phase of development. The manual nature of this aggregative process inevitably involves a high degree of subjectivity in arrangement. However, such constraints as were in place are sufficient for the purposes of illustrating an argument. It is also important to be clear that what is not being asserted

here is that it is the age of the buildings themselves that matter. Rather what is at issue in the experiment is the 'age' - or rather the temporal description - of the configurational arrangement itself, that the fundamental historicity of the emergence of a settlement forms implies. By establishing a 'naïve' point of departure, it is intended to establish some 'common ground' with which to develop the argument for a more temporally sensitive spatial description than that taken by Hillier and Hanson.

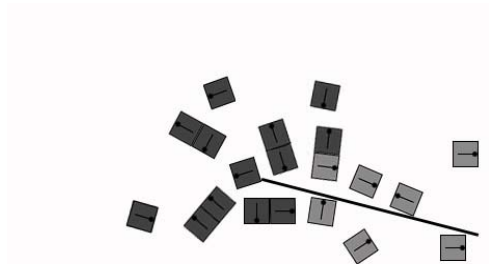
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a) epoch 1



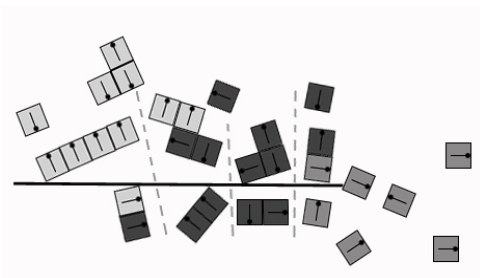
Loose configurational pattern with well-defined overall temporal description.

b) epoch 2



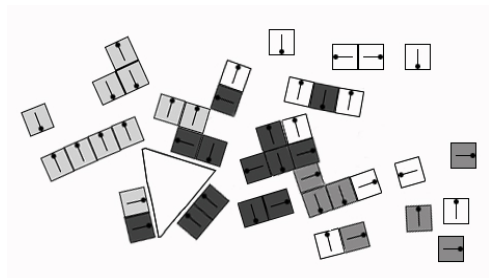
Axial description assembles two well-defined building epochs

c) epoch 3



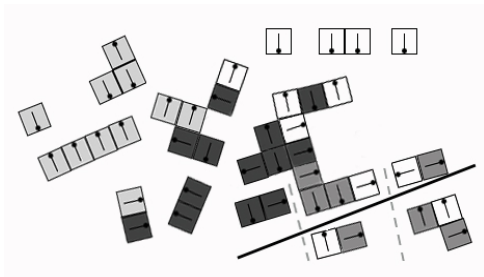
Segment descriptions assemble three well-defined building epochs

d) epoch 4



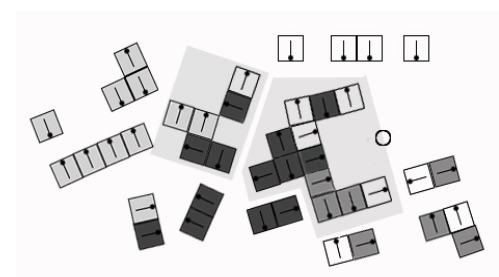
Convex description assembles two relatively well-defined building epochs

e) epoch 5 -
additional straightening represents 'improvement'



Segment descriptions assembled by combination of building epochs

f) epoch 6 -
addition of monumental structure represents continuity



Circulatory descriptions assemble a combination of building epochs; settlement has a complex overall temporal description

Figure 1: Experiment in generating elementary time-space description of configurational elements.

3.b. The retrieval of elementary time-space descriptions

The diagrams in Figure 1(a-f) provide a schematic model of the growth of an imaginary (but not entirely unlikely) settlement form in a manner that would be familiar to historical geographers, for whom representing the periodization of the built environment is of central importance (Conzen 1960). The settlement develops from a loose collection of buildings to an entity that looks at least approximately settlement-like. The first three epochs of buildings (a-c) comprise, more or less, discrete clusters of buildings; the fourth (d) is rather more spread out to the right of the diagram. By the fifth epoch several aggregations of buildings from different periods are creating clusters characterized by mixture of epochs.

Turning from historical to configurational descriptions, the arrangement of buildings in diagram (a) is perhaps unrealistically disordered for a single building phase that might be expected to be more 'planned'. The axial line in diagram (b) is a representation of the 'road' implied by the arrangement of buildings from two discretely clustered building phases. In diagram (c) the axial line is segmented in three places, twice at the seams between discretely clustered building phases, and once at an interruption or caesura between buildings within a clustered building phase. The convex space in diagram (d) is a representation of the 'open space' implied by the buildings that frame it across the seam of two clustered building phases. In diagram (e) the axial line is segmented in two places that are not easily characterized in terms of discrete building phases, but require a description in terms of the historical grain of the city. In diagram (f) this grain is evident in producing several aggregated blocks that have an approximate resemblance to circulatory structures.

In approaching the problem of description in this way, this author would argue that it soon becomes apparent that there are some properties of a settlement - even one as abstracted as in Figure 1 - which are related to a *process of temporal inscription* and which are inadequately conceptualized solely in terms of space. Here it is possible to do little more than raise the question: the proposition is that the 'signatures' of temporal inscription are intrinsically present in the relationality of material elements in the world, and are not reducible to their spatial articulation. It follows that it is probably impossible to identify an entity as such as a 'road' or a 'town square', or to project this notion onto an axial line, segment or convex space without tacitly acknowledging some temporal and spatial parameters and suppressing others. The suppression of the temporal relation is always likely not only because space syntax has (quite naturally) been primarily concerned with the spatial, but also because the inevitable limitations of representation (no matter how dynamic and technologically sophisticated) mean that the temporal sequence is imposed externally as an iterative 'modelling' process rather than emerging, in a more qualitative sense, from the situated experience of material reality; as Massey (2005) has argued, space itself is always liable to be rendered inert by its representation. However, once awareness of these issues are raised, developments in space syntax techniques can provide a good starting point for investigating the temporal presence in settlement form. For example, analysis of the contemporary spatial configuration of the London suburb of Surbiton using Turner's (2000-10) *Depthmap* software showed how segment angular choice at different metric radii sug-

gested historically specific aspects of the settlement structure (Griffiths *et al.*, 2010). In identifying longitudinal description of settlements in this way, the notion of the 'historical grain' tends to recur - suggesting the complex intermixing of time-space descriptions. One might also find notions such as *seam* and *caesura* useful to describe historically significant modalities of time-space continuity and discontinuity that are nonetheless consistent with the underlying relational ontology of Hillier and Hanson's theory.

These temporally accumulated 'affordances' of space, to appropriate Gibson's (1979) term, are difficult to interpret in isolation from the material world in which they are embedded - though they are an implicit presence in any spatial configuration. In the text accompanying Figure 1 (a-d) the verb 'assemble' is preferred to 'produce' (which might be considered a less loaded term) in order to indicate the constitutive relationship between an arrangement of architectural objects (buildings), an emergent 'road' structure and its subsequent translation into an axial line or segment for the purpose of syntactic description-interpretation. In a configurational thought experiment such as that illustrated in Figure 1 the background board is *tabula rasa*. This has the effect of emphasizing the emergent descriptions as *synchronic* because the axial line and the convex space describe a configurational topology synonymous with the totality of the system; a view consistent with that of a privileged observer. However, in reality no pristine state of *tabula rasa* exists in any theoretically satisfying sense and, therefore, no such totality or privileged observer position is actually possible. When *tabula rasa* cannot be assumed, one must propose that the process of agent description retrieval is mediated through the manifold scales of time-space that are *emplaced* in an ongoing process of inscription, and intelligible as descriptions to human agents *in situ*. In other words, the relationality of life in the inhabited material environment cannot be wholly abstracted without stripping it of much of its description-giving potential.

The consequence of this temporalized perspective is that spatial-configurational descriptions (for example those represented by axial or convex space) are revealed as inadequately theorized synchronically, without sufficient acknowledgement of their contingent and open nature as assemblages (or assemblings) of other descriptions at smaller and larger scales. The notion of the axial 'line' (or indeed any other configurational element) is itself intrinsically diachronic in its construction, an example of time-space 'scale coherence' in the finitude of inhabited space (Salingaros and West, 1999). The fractal-scaling properties of axial maps have already been established (Carvalho and Penn, 2004; Wagner, 2007; also Griffiths, 2009). One way of interpreting this scaling phenomenon is to suggest that one axial line 'unpacks' shorter axial lines, with a self-similar distribution across geographical scales; it is likely that convex space and street segments have similar scaling properties. Voss (1989) has argued that scaling phenomena are essential to how we 'inhabit' (one might say 'structure') the world in time. The diagrams in Figures 1(a-f) illustrate how, where temporal information is present, configurational abstractions such as axiality, convexity and segmentedness may need to be regarded as composite or nested structures of space assembled in time. Clearly, the presence of

such a multiplicity of imbricated time-space descriptions cannot be accommodated within a synchronic configurational model, not least because without a privileged observer there is no authority for preferring one scale of description to another one.

Thinking this time in terms of the buildings, one might suggest that where distinct epochs are clustered their temporal descriptions are 'well-defined' and where epochs are increasingly intermingled then the temporal description is less well defined. Traditionally, the aspect of space syntax theory that has been concerned with time has dealt with it in a fairly restricted sense relating to the experience of walking through the built environment (Penn, 2003a; 2003b; Hillier, 1996: 234-5). Here (most) people are moving but the buildings are assumed to be standing still. However, a fully realized time-space description would acknowledge that the buildings and the plots that they stand on are also moving. Furthermore, the ways in which people inhabit space cannot be reduced (conceptually) to a monolithic definition of pedestrian movement (Seamon, 1979); nor can it be assumed that such walking practices are a universal 'constant'. Urry (2007) has made the case for a distinctive 'mobilities paradigm' of geographical research. The dialogue between people architecture, objects and nature takes place not only across space but also across time. Time-space descriptions would not seek to contrast invariant (i.e. timeless) morphological structures with historical 'epiphenomena', but rather to understand configurational descriptions of flux and stability, continuity and change as these were afforded as descriptions to situated human agents.

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The historian Corfield (2007) has argued for the use of a neologism 'diachromesh' (a point in time-space unfolding in time frames of past and future) to accompany the more common 'synchronomesh' (a single point in time-space synchronically connected to all others). Thinking about historical descriptions of space clearly draws on both concepts to offer what Carlstein *et al* (1978: 256) have termed a 'holochronic' perspective. Corfield's binary of diachromesh and synchronomesh can usefully inform Hillier and Hanson's notion of order and structure in spatial description (Hillier and Hanson, 1984: 95-7; Hanson, 1989a, 1989b, Hillier, 1996: 234-6). 'Synchrony' - the amount of space 'invested' in a particular configurational description (such as an axial line) tends towards highly ordered 'symbolic' descriptions, easily readable as a plan; by contrast 'asynchrony' is intelligible as a structure revealed sequentially to the situated walker. The dualism of synchrony-asynchrony begs the question of the process by which different temporalities may be embedded and accumulated in configurational descriptions of the material world. 'Diachrony', in this more qualitative sense, might be thought to refer to the extent to which configurational relations are internally consistent (i.e. contemporary) in terms of their historical grain. By contrast, 'adiachrony' might refer not to an *absence* of time, but rather to an historical grain too complex to be easily retrieved discursively. While diachrony and synchrony emphasize symbolic potency (configurationally speaking), adiachrony and asynchrony are descriptions of complexity in time-space that need, in some sense, to be 'discovered' through social experience. One might also envisage synchronous-adiachronous and asynchronous-diachronous descriptions as invoking variations in the interplay of time-space and matter in assembling the material world. These ideas will be explored in the following section.

4. Possibilities for time-space description in space syntax theory

Years before Prigogine began working on the physics of thermodynamics Jacobs had commented that time is the 'constructive element' in the built environment, its 'indispensable' quality (Jacobs, 1993 {original 1961}: 174). Drawing on what was at that time the new science of complex systems, she meant that the multi-layered ecology of urban life could not be reduced to a 'plan' but was essentially a self-organizing process that needed to be understood for itself. Half a century on these insights have been developed into a substantive literature on cities as complex systems (Batty and Longley, 1994; Batty *et al*, 2007; Batty, 2008). Illuminating though much of this work is, its origins in geographical spatial analysis and network science tends to mean the focus is on building models of urban systems that can be applied to issues facing contemporary urban society. While such models are temporal in the sense that they are interested in growth processes, the critique of their temporality is much the same as has been applied to the theory of spatial description in space syntax research. In other words, time tends to be projected onto the system by an external observer - models may be iterated and re-run with adjusted parameters.

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To advocates of such approaches the idea that it is the 'internal time' of such models that might be of interest - that is, as it would appear to an embedded observer - might seem irrelevant, even ridiculous. However, for historical research that is precisely the nature of the conceptual jump that needs to be made, since it is the internal assemblage of the material realm and its internal differentiation in time-space that give rise to the kind of configurational descriptions historical researchers are most interested in: i.e. those that can help to understand how processes of change and continuity were manifested within a particular society. The notion of 'internal time' as developed by Prigogine and his colleagues seems to be particularly fruitful for the development of research in the tradition of Hillier and Hanson, but in a more historical and contextual direction. From this perspective, the privileged position of the observer is no longer tenable, and as a consequence it is necessary to accept a degree of ambiguity in descriptions of (historical) space.

In summary, the notion of 'internal time' pertains to the history of structural (we may prefer the term 'configurational') transformations internal to a system as it self-organizes over time. A self-organizing system that is 'open' (i.e. to energy in the form of external perturbations) might be expected to evolve local states characteristic of equilibrium (order-stability) within an overall systemic tendency to disorder (thermodynamic entropy). What is interesting in such systems is that they tend to evolve order from states of disorder in an essentially unpredictable manner through successive phase-changes characterized by bifurcation. The internality of time in such systems is demonstrated by the impossibility of reversing this temporal process; any such theoretical attempt would come up against the 'entropy barrier'. This essentially means that the evolution of the system is subject to any number of initial conditions that are statistically unknowable in the current state of the system. Effectively, you need more information to go backwards than the system can possibly contain, because the process of evolution means that some information pertaining to those initial conditions must be lost as the system evolves higher and higher form of complexity through morphogenesis.

However, it is now acknowledged that this evolutionary process does not erase temporal information from the system. On the contrary, Prigogine and Stengers (1984: 286) explain how physicists are exploring the 'inscription' of irreversibility (internal time) into the structure of matter. In other words it is possible to talk about such systems having a *history*, which can be retrieved through description. By postulating an imaginary observer situated within a convection current. Nicolis and Prigogine (quoted in Sandbothe, 2007: 53-4) argue that a qualitative sense of time and space for such an embedded observer arises in non-equilibrium conditions through local awareness of emergent temporal and spatial asymmetry at the microscopic (local) scale, that becomes inscribed into the structure of the system and determines the course of its macroscopic ('global') evolution. Sandbothe (*ibid*) emphasizes that it is the process rather than the structure that is determined; the precise evolution of the structure itself is sensitive to initial conditions and cannot be determined with any precision. To emphasize such a mnemonic or *historical* description is, in the first instance, not a property of the embedded observer but of the system itself (*ibid*: 53). It is in this sense at least, consistent, in principle, with Hillier and Hanson's theory of spatial description as something that needs to be retrieved. Elsewhere Prigogine and Stengers (1996:170) have commented that:

'...the flow of time depends on a history of events, but Newtonian time is universal and independent of history. Now time itself becomes history dependent'.

Historical time then, should not be regarded as completely synchronized in space, because it is not only an intrinsic property of a system's structural evolution in the material world, but also that any account of a description needs to acknowledge the describers' own embeddedness in time and space (Vrobel, 2007: 278). Once the notion of the privileged observer is dismissed (one may still 'observe', of course), then any such description is dependent on relative positioning: the constitution of the 'here' and 'there' in the 'now' and the 'then'. One might extrapolate that once it becomes difficult to delineate authoritatively what is 'local' and what is 'global', then the 'history of events' and morphological history can hardly be categorically distinguished; it depends where you stand.

Helpfully, for the purposes of this paper, Prigogine and Stengers (1984: 272-3) draw on examples of cities to explain the notion of 'internal time'. They contrast Brasilia and Pompeii as examples of 'planned' cities with a relatively 'well defined internal age' in contrast to Rome where the buildings are of many different ages and, in this sense, have more complexity that can be described in terms of average internal age. To the embedded observer such a description implies a degree of synchrony - clearly the different temporal elements are contiguous in configurational terms - but also give rise to distinctive seams, caesura and grain in the configuration where relatively local and 'global' descriptions are not equivalent. It also gives a sense of how a city may be 'full of time' in the sense that its configuration contains the 'inscriptions' of manifold temporalities, with each assemblage leaving its mark on the last. In this sense, the role of description is to emphasize the time-space asymmetries that architecture creates in refutation of the inert backdrop of space so substantively undermined by Hillier and Leaman in 1973.

Prigogine and Stengers (*ibid.*: 299) have this to say on the subject of description as something that is at once 'objective and participatory'.

'...each level of description is implied by another and implies the other. We need a multiplicity of levels that are all connected, none of which may have a claim to pre-eminence' (*ibid.*: 300)

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The multiplicity of descriptions that become available once the temporality of space and the relative position of the observer is acknowledged, come with difficulties for those who would assert a single authoritative description of the shape of inhabited space. It does so by introducing ambiguity into time-space description - in other words a single layer of description cannot even begin to account for reality, historical or otherwise. Following Geertz, we need 'thick' time-space description to emerge from historical research before we can begin to understand social organization in the way in which Hillier and Hanson aspire to do. Interestingly, Hillier (1996: 227) argues that an admission of ambiguity in spatial description does not mean that all such research is 'doomed'. He argues that space syntax is a 'structured ambiguity'; this author agrees, but the argument advanced here is that the range of *configurational* ambiguity might be significantly greater - and more productive, at least in terms of historical research - than Hillier envisaged, once the temporal element is admitted. It is already possible, using key space syntax concepts, to get a sense of how a particular assemblage of space may yield a wide range of spatial descriptions from the position of an embedded observer. The three examples discussed below all raise particular questions about the conceptualization of 'scale' in space syntax theory.

Firstly, and most simply, a given point in space has both an axial and a convex description, in the sense that the point can be represented in both one and two dimensions (Hillier and Hanson, 1984: 91). These descriptions can be applied at different resolutions, for example when Hillier describes urban centres characterized by small blocks, making for easy circulation, as 'convex' (Hillier, 1999: 117). At whatever scale it is constituted therefore, spatial descriptions that emphasize linearity are more likely to pertain to movement through a system, and those that emphasize convexity are more likely to pertain to relatively static areas of social interaction within a relatively 'local' system (Hillier and Hanson, 1984: 17; Hillier, 1996: 316). The fact is that any given point in space has a spatial description pertaining to *both* its linearity and convexity and that these are also ambiguous with regard to the scale of the observation (Griffiths and Quick, 2005). An observer has no way of knowing which scale is 'authoritative' without some knowledge of social context. Indeed there is no reason why any scale of description should be considered authoritative. This ambiguity creates a hermeneutic potential. In this author's own historical research, for example, it proved useful in conceptualizing how Sheffield's streets functioned simultaneously across different scales to sustain the organization the city's cutlery industry over a rapidly extending urban area (Griffiths, 2008). This material emplacement of manifold scales of social practice implies an ongoing historical process of temporal 'inscription' present in the built environment.

A second source of ambiguity is the theory of 'distance concepts' (Hillier and Iida, 2005). Hillier and Iida argue that distance possesses three distinctive modalities: topological (number of turns), angular resistance (straightness) and metric (units distance). They contend that 'our notions of distance are compromised by the visual, geometrical and topological properties of networks' (*ibid*: 476). They further argue that metric distance pertains to movement at the most localized scales but that when considering space 'above a certain threshold' people conceptualize distance through a mixture of topological and angular intuitions. Hillier characterizes this as a 'phenomenology' of distance (Hillier, 2005: 19-20). These three distance concepts (it is likely there are further variations) suggest how time-space descriptions may assemble the same elements of material reality in different ways. A section of road can be a highly local environment, part of a neighbourhood and on a much longer route. These descriptions are likely to reveal something of the history of the road; in the absence of social context no description can be said to be privileged over the other; we can think of them only in terms of different *modalities of scale*. These ideas have been developed empirically as part of an investigation into how the expansion of Sheffield into its rural hinterland expanded the range of time-space descriptions that could be applied to the villages (Griffiths, 2009).

A third source of ambiguity is the notion of scale itself. Hillier and Iida's work on distance concepts offer a more fluid and imbricated sense of the role of scale in constituting the lived experience of urban space than the rigid binary pairing of 'global' and 'local' but, the full implications of this have not really been explored as analysis tends to prefer one mode of analysis (typically angular) over the others, and examine this at selected metric radii approximately equivalent to scales of pedestrian or vehicular movement. Scale is most directly addressed as an issue in Hillier (1996) in terms of the 'interfacing' of social interaction:

'...between the movement within buildings and the movement on the street, between localised movements in less important streets and the more globalised patterns of movement, and between the movement of inhabitants and the movement of strangers entering and leaving the city' (Hillier, 1996: 174).

However, this sense of scale seems unduly restricted, since how is it possible to distinguish categorically between those who are said to 'move' globally in space and those who are said to 'occupy' it locally - without bringing a whole range of contextual knowledge to our definition of these scales? In historical space the reality is even muddier - certainly at the most conventional scales 'the city' for example, descriptions may be fairly readily agreed. But this is likely to be only one of the descriptions retrieved by the embedded observer, and like all descriptions, it must be regarded as contingent and of uncertain duration. Such a conceptualization of 'scale' as a recoverable description of a time-space 'frame' characterized (to a greater or lesser extent) by a stability of description would, it is argued, help the space syntax researcher to account for the infinite variety of human activities,

even those which take place nominally in the 'same space'. This author found the development of such a theoretical position necessary in researching the socio-economic and cultural aspects of early industrial Sheffield 'through the prism of space' in a study that aspired to provide an 'holistic' history of an urban community over an extended period of time (Griffiths, 2008).

It was mentioned previously that the fundamental object of space syntax analysis, the axial line, displays fractal-scaling properties. However, the physicist Vrobel (2007:80) argues that models of most fractal structures possess no internal time in the sense that the temporal information they contain is erased as the fractal unfolds, such that succession is lost'. To counter this Vrobel advocates a theory of 'fractal time' in which the 'primary time' of the relatively positioned embedded observer displaces the absolute Newtonian time of the external observer. It follows that a characteristic of fractal time is a 'resolution-dependent' (rather than an infinite, scale free) geometry (*ibid.*: 285) in which synchrony makes room for a meaningful sense of temporal succession. It is interesting in this context to note the important distinction made by Bergson between temporal 'sequence' and 'succession'. Whereas 'sequence' implies one event following another and pertains to narrative, 'succession' involves what we could call the diachronic configuration of a multiplicity of temporalities in the historical moment (Massey, 2005 and Bentley, 2006 - but with sharply contrasting takes on Bergson). The question then becomes, 'where are the descriptions of such temporalities to be found in material culture?' - this is surely a task for historical research into the built environment. In configurational terms, the implications of this argument are that time should not be theorized reductively as the constant movement of an individual *through*, but largely detached *from*, synchronic space. Instead, it acknowledges Hillier and Hanson's theory of spatial description as an important and productive starting point towards the development of a distinctive historical ontology of time-space description, and as a fertile source for innovative research into the deep historicity of built environments past and present.

5. Conclusion

So where does this discussion of temporality in Hillier and Hanson's theory of spatial description lead? Further theoretical development would certainly require engagement with the work of Netto (2007; 2008). His distinctive elucidation of a social theory of 'semanticized space' through which individual acts or events become communicable as social practice certainly has resonances for expanding the contextual scope of built environment history. Although Netto is not concerned with the approach to temporality as the 'internal time' of the built environment that has been advanced in this paper, his broad advocacy of the hermeneutic potential of space, and his rejection of a privileged (i.e. totalizing) interpretative position open up the problem of spatial description posed by Hillier and Hanson to a wider theoretical examination. Another direction looks towards further empirical work that challenges those spatial descriptions (for example 'local' and 'global' and so on) that have become conventional in space syntax research, and turns instead to identify a wider range of descriptions in the phenomena, creating a greater hermeneutic potential. For historical studies the question of how quantitative syntactic descriptions should be translated into a discourse that is meaningful in terms of

the historical narrative is an important issue. It involves balancing the particularist demands of narrative with the generalizing nature of configurational explanation. In the absence of a more sensitive lexicon for describing time-space phenomena in the material world, key locative and temporal concepts such as 'close', 'far', 'local', 'here' and 'there', 'now' and 'then', insofar as these imply particular conditions of situatedness, can go completely unhistoricized and, therefore, escape historical interpretation. For example, the English cities associated with the 'industrial revolution' are often casually distinguished by their 'rapid physical expansion' and 'great size' but what do these descriptions actually mean historically, and how should the historian - living in a time of much larger cities - understand the affect of such transformations on people's lives? Research in built environment history should seek to hold such anachronistic spatial clichés to account. Hillier and Hanson's theory of spatial description and some of the elementary descriptions space syntax research can provide, have the potential to make much progress in this respect. Recognizing the problem is, however, only a beginning. A language of historical space cannot emerge from theory building; it starts with the empirical task of description.

8. Notes

¹ A more detailed review of approaches to historical research using space syntax is in preparation for the 8th International Space Syntax Symposium in Chile, January 2012.

² Attributed to the geographer B. Berry

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