Society Seen Through the Prism of Space

Outline of a theory of society and space

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Abstract

Two questions challenge the student of space and society above all others: will new technologies change the spatial basis of society ? And if so, will this have an impact on society itself ? For the urbanist, these two questions crystallise into one: what will the future of cities have to do with their past ? Too often these questions are dealt with as though they were only matters of technology. But they are much more than that. They are deep and difficult questions about the interdependence of technology, space and society that we do not yet have the theoretical apparatus to answer. We know that previous 'revolutions' in technology such as agriculture, urbanism and industrialisation associated radical changes in space with no less radical changes in social institutions. But we do not know how far these linkages were contingent or necessary. We do not, in short, have a theory of society and space adequate to account for where we are now, and therefore we have no reasonable theoretical base for speculating about the future. In this paper, I suggest that a major reason for this theoretical deficit is that most previous attempts to build a theory of society and space have looked at society and tried to find space in its output. The result has been that the constructive role of space in creating and and sustaining society has not been brought to the fore, or if it has, only in a way which is too general to permit the detailed specification of mechanisms. In this paper I try to reverse the normal order of things this by looking first at space and trying the discern society through space: by looking at society through the prism of space. Through this I try to define key mechanisms linking space to society and then use these to suggest how the questions about the future of cities and societies might be better defined.

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Society, technology, theory of space, spatialization

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> *The modern city is losing its external and formal structure. Internally it is in a state of decay while the new community represented by the nation everywhere grows at its expense. The age of the city seems to be at an end'. Don Martindale 1958 in his Prefatory Remarks to the translation of Max Weber's 'The City'.*

> *'At the turning point between the twentieth century and the twenty-first, a new kind of economy is coming into being, and a new kind of society, and a new kind of city: some might say no city at all, the end of the city as we have known it, but they will doubtless be proved wrong' - Peter Hall in the last Chapter of Cities and Civilisation: 'The city of the coming golden age', 1999*

Introduction and review

In my first paper to this Symposium (Hillier 2001a) it was proposed that the social construction of space in human settlements was mediated by spatial laws. The laws were of two kinds: those by which different ways of placing buildings gave rise to different spatial con-

figurations; and those through which different spatial configurations created different patterns of co-presence amongst people through their effect on movement. What were loosely referred to as different 'social forces' then expressed themselves in space through the different requirements that each placed on co-presence. For example, residence tends to restrain and structure co-presence, and therefore to arrange buildings to achieve relatively localised and restrictive spatial configurations,while microeconomic activity tends to maximise co-presence and thus to arrange buildings to integrate space locally and globally.

This shapes a city into two broadly different spatial elements: on the one hand a residential background of spatial areas whose spatial patterning varies with culture, depending on the way in which that culture seeks to restrain and structure co-presence between, say, inhabitants and strangers or men and women; and on the other an interlinking global system of public space, usually expressed in the axial map as some variant on the 'deformed wheel', generated mainly by spatially invariant (in the sense of always seeking to maximise co-presence) microeconomic processes . Thus in settlements space operates in at least two distinct modes, one 'conservative', the other 'generative' : the conservative mode restricts co-presence in order to conserve or reproduce cultural patterns; and the other generates the maximum co-presence in order to optimise the material conditions for everyday life. (Hillier 1996a) Through this theory, we were able to suggest why large settlements, in spite of their manifest differences, tend to have certain generic similarities. They are a consequence of spatial laws mediating the relation between configurations of social activity and configurations of space.

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Some theoretical implications

There is of course nothing new in either of the two socio-spatial propositions on which this argument depends: that economic processes tend to operate uniformly and culture idiosyncratically. All we have done it to suggest how the same laws give spatial expression to both, and through this generate the basic features the spatial layouts of settlements. But this does raise interesting theoretical questions about the current debate on the nature of cities and their possible future, or lack of a future. First, it implies that the relation of social activities to space is *generic*, rather than *specific*. It is not this or that pattern of activity that give rise to the durable spatial patterns that we find in cities, but the demands that different *kinds* of activity make on co-presence, which articulate the spatial laws to make one kind of space rather than another. In fact, because two sets of laws intervene between social activity and space - laws governing the emergence of spatial patterns from accumulated local actions, and laws governing the impact of those spatial patterns on co-presence - it means that the relation of society and space is *two way generic*: generic aspects of social action relate to generic patterns of space.

This is why in general - and with important exceptions - during the life of a city space changes only slowly while activity changes rapidly. We do not find that new phenotypical patterns of activity *per se* generate new patterns of space, but that new patterns of activity have a certain distribution of demands on co-presence, and that to the degree that the new distribution approximates the old, the new pattern will be absorbed into the existing urban framework with comparatively little change. Appendix 1 to this paper outlines a case study of the City of London, drawn largely from the work of Julienne Hanson, showing how radical this adaptation can be. When assessing the impact of new activities on space, then, what we need to compare is not so much the contents of new activities but the range of demands they are likely to make on co-presence. The question we must ask about the future is then: have we reached a radical discontinuity in this process of slow and fast change ? Are technological and

social changes now generating patterns of activity which will be incompatible with the distribution of spaces that we currently have through current patterns of urbanisation. And will this lead to a radical change in the demands that society place on space, perhaps leading to a radical transformation of cities or even as some have suggested to the end of cities as we have known them.

A second implication of the theory is that social forces have inherent spatiality within them, so strong and systematic that it is capable of being articulated by spatial laws, and so clear that can be detected by the careful examination of real patterns of space. What is particularly interesting from the point of view of a theory of society and space is that the spatialities we have seen operating in cities cannot just be in the nature of things, since the city is only one spatial state of society amongst many others. A further questions then arises: might there be other social forces with other spatialities, for example those that give rise to nonurban patterns ? And how might these be relevant to the possibility of a post-urban society ?

The third implication is that space plays a *constructive* as well as a *receptive* role in shaping the forms of social action that we see in cities. The question is, is it also constructive of the underlying generic patterns of urban societies, of the genotypes of urban society, we might say, as opposed to the phenotypes ? This is a legitimate question because wherever human activity has generated cities, for whatever reason, it seems also to have changed a great deal else: social institutions, lifestyles, habits of thought, and even the nature of human social and individual identity. A city is both a transformation of space and a transformation of society. We do not really have a coherent theory for this, in spite of the number of social as well as urban theorists who have been concerned with it. It is not logically plausible that all of these changed and that cities were built as a consequence. In the rise of cities space and society seem at the very least to have changed together.

The question we are now facing then is: if space is now changing, will society also change. If we are entering post-urban space, then what does this imply for post-urban society? It is clear that we cannot hope to answer such questions simply by studying cities. We need to know what it is about societies that interacts with space and underlies the changes that historically seem to have occurred in one when they occurred in the other. We need to understand what an urban society is in the space of possible societies ?

Aim of the paper

The aim of this paper is to sketch a way of approaching these question by initially at space, and trying to detect society through space, in contrast with most commentaries on society and space which typically look at society and try to detect its output in space. Here we will take a frankly spatial point of view of the same question: to look at society through the prism of space, and trying to outline a theory of society and space *seen from the point of view of space*. The text will as a consequence be rather thin on discussions about society in the usual sense, because the aim will be to isolate what it is about society that turns itself into space, and what it is about space that turns itself into society. Having seen the signs of inherent spatiality in social forces, we are now looking for it in society itself.

The theory of society and space sketched here - and we must emphasise that it is only a sketch - implies two main critiques of much existing theorisation. The first is that because most attempts to build a theory of society and space look at society first, the *constructive* role of space in creating the generic forms of society has not been brought to the fore, or if it has, only in a way which is too general to permit the detailed specification of mechanisms. The

second is that much explicit theorising about space has succumbed in one way or another to what might with hindsight be called the 'myth of historical spatiality' - the idea that in the past we were much more spatial and localised than we are now, and therefore find the present strange and alienating. This myth has afflicted the spatial disciplines, academic and applied, throughout the twentieth century, and obscured the implications of a growing body of research results which have accumulated over the past few decades in fields as far apart as the study of hunter-gatherer societies (Lee & Devore 1968), tribal societies (Turner 1957), social networks (Granovetter 1982, Fischer 197x, Poole & Kochen 1978, reviewed in Albrecht G et al 2000), organisational dynamics (Allen, 1977) and many others which have in common that they suggest that the fundamental mechanisms that operate in society are not only those that solidify local groups but also those which create nonlocal networks, including those which favour the nonlocal at the expense of the local.

These results raise - or ought to raise - a fundamental question about how we see society in general in a spatial context. What would be the implications for a theory of society and space of the proposition that the core mechanisms in human societies historically were not only local and spatial, but also nonlocal and virtual ? This paper will explore this question and will suggest that if we continue to contrast our present situation with the historic past on the grounds that they were local and we are global, or that they were spatial and we are virtual, then we cannot understand what is happening how. All the evidence is that human societies were always - at their appropriate scale of course - global as well as local entities , and virtual as well as spatial entities in some 'face to face' sense. Im fact it is only by studying the mechanisms by which societies become virtual and nonlocal that we can be guided towards a theory of society and space, because the very fact that a society exists means that the interstitial spaces distancing discrete individuals and co-habiting groups from each other have been overcome. It is *how* space is overcome that is the essential linkage between society and space, and, because society can only be created by the overcoming of space, it also provides clues to the morphological dynamics of a society. It is for this reason that we find that the key items of 'social software' - that is, the rules, beliefs, values and practices which guide our space-time 'situated practices' - are those which on the one hand that lead to the overcoming of distance to create relations across space, and those on the other that control the effects of lack of distance amongst locally proximate groups. These are the raw materials of a theory of society and space.

Difficulties of the project

How then should we seek to construct a theory of society and space ? We must begin by acknowledging certain basic difficulties in the project. Whichever way we look at it, the very possibility of a theory of society and space presupposes that the relation between the two is in some sense systematic. If it were not then there would be nothing for theory to latch on to. But the very idea that this might be the case raises severe difficulties. Logically, there cannot be a systematic relation between society and space unless two conditions are fulfilled. The first is that space must have, or at least be capable of having, social potentials of some kind since if it does not, it cannot embody whatever it is that society sends to it. The second is that society should have or be capable of having spatial necessity of some kind, since if it does not then it cannot impose itself on space in a way in which space can receive it. For example, if

society is an entirely immaterial entity - say, a consensus amongst individuals - then it cannot matter how it is deployed in space, since all deployments will be equal and leave the social consensus as it is.

The first of these two problems has been the preoccupation of space syntax research: to show that space through its very form and configuration can express social potentials, carry social contents, and through this take part in the production and reproduction of society. But how can the concept of a society contains spatial necessity. The idea seems paradoxical. If we examine less inchoate and less general social concepts such as a family or an organisation, we find that each is a structure of roles and relations which can be drawn up in a diagram which will be the same however it its realised in space. The space-time realisation does not affect the essential description of what the social entity is. Spatial form may affect the dynamics of a family or organisation, but it will not change it basic defining diagram. How then can society differ from these lesser social entities in having spatial necessity as part of the definition of what it is ?

Let us look a little more closely at what we mean by society. It turns out that there is a spatial problem at the very heart of the concept of society, which must be solved by any social theory which includes a definition of what a society is. It is obvious enough. The individuals who make up a society are clearly well-defined space-time 'things' in the sense of being bounded and occupying a well-defined and continuous region of space time. However it is not clear in what sense any higher level pattern of relations amongst these individuals is, or even can be, in any comparable sense an acceptable 'thing'. It lacks the very combination of space-time boundedness and continuity that allows us to identify it as a thing in anything like the normal sense. Of course, a society is likely to occupy a territory of some kind, but this does not solve the problem. To occupy a continuous territory is not the same as to constitute a continuous space-time entity. A society seems to be composed only of freely mobile discrete individuals. If it exists at all, then whatever it is, the large scale entity, society, is not a space time 'thing' in any familiar sense. (Hillier 1996a)

This is the core problem of social theory and it is a problem of space. For society to exist the spaces between individuals and between spatially proximate groups must somehow be filled up or overcome, and a superordinate system of some kind imposed. But what kind of a system can that possibly be ? We have no conception of such a system. Social theories can be seen as a range of solutions to this problem. At one extreme methodological individualism asserts that no such superordinate entity exists, and that society can be reduced to its individuals. (Weber 1947) At the other, organicism - the idea that society is some kind of organism - tries to redefines what is manifestly a spatially disconnected system as one which is after all spatially connected. (Spenser)

From abstract relations to emprical configurations

What kind of a system then could a society then possibly be ? One line of enquiry begins by acknowledging that we are up against the ancient and deep philosophical problem: that of defining what *relations* are, as opposed to the things that are related. Are relations real in the sense that space-time 'things' are real.This is most succinctly expressed by Russell. The relation that Edinburgh is to the north of London does not seem to be a material thing in the same sense that Edinburgh and London are material things, so we are tempted to see it as a mental construct rather than as a property of the real world. Yet within the scheme of things defined by this universe Edinburgh 'really does' seem to be to the north of London,

and the relation to exist 'out there', written into things themselves. (Russell, 1912) So we are tempted to assign relations to a world which is neither mental nor physical, but accessible to us through our intelligence rather than our senses. But this means that if society is essentially a relational scheme linking individuals, and relations do not belong in this world, the consequence is that 'society' is taken out of the world of space and time and placed in another free from space-time from which it can surely exercise no direct influence on this one. If there can be no theory of society and space unless we can show spatial necessity in society, then it seems that we cannot solve the problem of society and space unless we first solve the problem of the space-time status of relations.

Now from the point of view of space syntax, this is an interesting formulation of the question because whatever space syntax does it seems to show how a complex system of relations can be a measurable empirical fact, and as such constitute both an independent and dependent variable in the structure and functioning of a material system. This was brought to light by taking the highly improbable step of removing space from its embedding in the social and physical nexus of the real world and treating it as a thing in itself, as a pure set of relations. This idea would strike many as a clearly mistaken strategy, since everything that is interesting about space surely connects it both to society and to the material world. How can a theory of space be constructed by removing from space all that seems to make it relevant. However, it was only by extracting space from its embedding and treating it as a thing in itself that we are able to bring to light its configurational properties, and it turns out to be these that link space back to society, both as a receptor of social forces but also an an active constructive agent in society.

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The pathway from abstraction to measurable 'fact' in the study of relations in space syntax is taken in two steps. First, the concept of relation is rewritten as the more complex concept of 'configuration'. Configurations are relations that take into account other relations. One immediate consequence of this is that a relation between two things that appears to stay the same can actually be configurationally different when embedded in a different relational context. For example, a pair of linked rooms off a corridor form a different configuration with the corridor depending on whether one or both are linked to the corridor, even though the relation between the two rooms appears to stay the same. (Hillier 1987, 1996) The difference between the two configurations then seems as hard edged as we expect 'things' to be, in that each delimita possible human movement in a different way. In one case we must pass through one room to get to the other from the corridor, in the other we may go either way. Just as a 'thing' blocks our way, so a configuration of openings constructs possible ways and forbids others in a no less coercive, but essentially relational, sense. Configurations, which are constructions from relations, seem quite hard-edged things, even if relations are not.

The second step is that by correlating configurational analysis with, say, patterns of real movement, we can show that configuration has independent effects on the material world which cannot be mistaken for the effects of anything else (Hillier 1993). In fact, if the theory of the 'movement economy' is even partly the case, then it means that a complex relational entity - the configuration of the urban grid - drives the evolutionary dynamics of the urban system under the impact of social and economic forces. This argument does not depend on a cognitive connection by which we might argue that intelligent beings with immaterial minds have to decide where to move. If we move mindless agents in a computer randomly

one step at a time in a configuration, then the agents will be distributed according to the connectivity of each element. Configurations, its seems, as composites made out relations, are empirical facts with predictable empirical effects things in the real world even if simple relations are not.

Strongly relational systems: society and space compared

The power of spatial configuration over what can be seen to happen in a city is so powerful, that we are compelled to the conclusion that cities, seen spatially, are *strongly relational systems* (perhaps we should say 'strongly configurational systems'), that is systems in which the relations of each element to all other are more important for the structure and functioning of the system than intrinsic or virtual properties of the elements themselves. (Hillier 1999a) It is because they are strongly relational that spatial systems can be usefully conceptualised and analysed as very large graphs using configurational measures which relate elements of the graph together however remote from each other they may be within the graph. The concept of a strongly relational system allows us to show that a set of related space-time events (such as the occurrence of particular spaces) which cannot be seen all at once, can nevertheless be shown to be real space time systems with 'configurational' structures which are intrinsic to them, and which mediate their relations to other domains.

From the point of view of either a theory of society or a theory of society and space this is an interesting formulation, since, whatever else societies are, at one level they seem to be relational - and perhaps configurational - constructs out of individuals. Is is conceivable, perhaps, that the concept of a strongly relational system might be useful in understanding the superordinate relational systems which appear to be a key part of what societies are. Let us first consider some striking parallells between spatial and social systems:

- first, both are *dual* systems in the important sense that each seems to be made up of *material events* which take place in space-time, such as interactions and encounters, and *informational entities* such as the codes and conventions which seems to govern these material events locally (though not globally at the level of the emergent large scale system). We might say that society has both hardware (interactions) and software (rules governing interaction).

- second, both seem to be for the most part (in spite of utopias and ideal cities) *emergent* systems arising from *distributed* processes, rather than designed systems. What needs to be explained in both cases is how an overall pattern of some kind is created over time by the independent activity of large numbers of agents in different locations.

- third, both types of system seem to be *partially ordered*, in that each permits a great deal of randomness to co-exist alongside reproducible patterns;

- fourth, both appear or be partly or even largely *nondiscursive* in that human beings operate at least their local patterns competently, without being able to say what it is that they are doing, so that while each is the outcome of human activity, and is utilised by human beings in everyday life, analytically speaking we have at best an unclear idea what it is that we understand.

- fifth, both types of system seem, in spite of their *bottom-up construction*, to exhibit some degree of *top-down* as well as bottom-up *functionality*, in that just as, say, movement and land use patterns are functions of the overall structure of the urban grid, so individual social behaviours seem to be - though to a varying degree - functions of the overall pattern we call society.

These are striking analogies, on the surface at least. Is is possible, then, that the concept of the strongly relational system might be useful in conceptualising what a society actually is. After all, we seem to be hard put to it to find no other way to conceptualise what it is that might exist above the level of individuals and constitute the 'real' counterpart of what we call society. On reflection, what space syntax has actually done, if it has done anything, is to bring to light space as a hidden variable in the city by showing its essentially configurational nature. Space was hidden not because space cannot been seen (though this is also a problem) but because space is configurational, and configurations, like relations generally, are nondiscursive. We deal with them as ideas to think with rather than ideas to think of. Is it possible, then, that there are hidden configurational variables in society ? And if there are, since they will show that space has been overcome and a large scale entity called society created, can this also lead to way to solving the problem of spatial necessity in society, and so pave the way to a theory of society and space ?

Finding space in society

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Where then should we look for a space-time strongly relational system in society ? There appear to be only one possibility. What appears of society in space-time as its 'hardware' is interaction and copresence, so we must look at these. However, if we look carefully at interaction and co-presence, then at first it seems to lead us away from the idea that society has significant space time contents, and it does so for two reasons. First, although interactions occur in space-time they do not accumulate in space-time as spaces do to form a larger and larger connected system. They vanish, like blips on a computer screen flashing on and off, and leaving no trace in space. Second, as soon as we observe interaction, we see that it is governed by conventions and rules which reflect who is interacting, how their statuses relate, what is going on, and so on. Thus the same individual walking down the Tottenham Court Road will interact in one way with an old friend met in the street, another when ordering profiteroles, another another having narrowly escaped a parking ticket and another having just acquired one. In interaction, the social software rather than the empirical hardware seems to be the important thing.

This invites an - often made - comparsison with language. The space-time events we experience are shaped by abstraction which we do not experience in the same way, yet it is the presence of these abstract rules and conventions in the space of interaction that render interactions intelligible as social events. As with language, although the rules are manifested only in individual behaviour, they must in some sense be independent of individuals if they are to carry the burden of making interaction socially intelligible. Since we cannot find these rules and conventions in space time, we conclude that what is social about interaction are the abstractions that govern it. We reasonably conclude, then, that society, like language, is essentially an abstraction - one imposed on and constructing space time reality, but in itself an abstraction nonetheless.

However, if we pursue the analogy with language a little more closely, we can begin to reconcile the idea of social rules as abstractions with a role for space-time in constructing society. As with society, we find it difficult to say where language is. We might say 'in the heads of individuals', but this raises problems. It is unlikely that anyone one individual has the whole of a language in his or her head, and in any case what would happen after the demise of that individual ? Also, language is preeminently a social thing, the property of a language community and constantly changing in some respects, reflecting its social nature, while re-

maining relatively fixed in others. But if being in individual heads cannot account for all aspects of its existence, where then in language ? One answer is of course is that it is in space-time, in the dispersed language practices of the individuals who make up the language community. We may then say that language is reproduced through time by being realised in space. The 'language DNA' is out there in the real world of linguistic practices, not simply in our heads. The role of space-time in language is thus to be the medium through with language structure is reproduced by being produced.

This is not a bad role for space time, and if it can be applied to the abstractions that govern language, then it can certainly be applied to society. A similar argument was used in 'The Social Logic of Space' (Hillier & Hanson 1984) to describe how cultural patterns of space were created and reproduced. It was proposed that space acted an an 'inverted genotype' in that the information needed to reproduce cultural patterns of space was to be found in the spatial configurations themselves (and it is this of course that we seek to retrieve through syntactic analysis) as well as in our heads. We then proposed that we interact with configurational information in the real world by our ability to retrieve abstract descriptions from concrete realities. For example, if one person builds a house and a second person places their house next to it, then a third person may 'get the idea' of a contiguous neighbour relation and place his or her house next to one of the existing two, and if this process continues a line of houses will be created. Thus 'rules' guiding what happens in space-time, and leading to emergent patterns, do not have to exist in our heads as preprogrammed rules: they can be retrieved as logical properties from space-time reality, and used as templates for further action in it. Through this we sought to make our escape from the constrictions of the 'brain structure' theory of rule governed activity as put forward being leading proponents of structuralism.

A very similar idea of course underlies Giddens' concept of the *duality of structure* in human societies: that while being 'virtual', structure in society is both the medium and the outcome of 'situated practices' in space-time and these therefore link the production of social realities in space-time to the reproduction of their structures. (Giddens 1984) . 'Structure' in society is thus comparable to that in language and can be conceptualised in the same way: it is both realised and reproduced in space-time. This is a compelling argument, though it does not deal theoretically with what may be a major difficulty that the 'inverted genotype' concept did attempt to engage: that societies are not simply embodiments of rules but emergent large scale patterns that cannot be described fully through an account of the local rules which construct them. Most of what society is is going on is 'out there' and our knowledge of rules can generate emergent patterns throughrecursive activity, it does not include a description of the emergen structure. This seems to be a difficulty in principle with the Giddens scheme. However, it seems to be a key fact of human societies that its members at best only poorly grasp the large scale structure, and indeed that may be why all societies seem to have specialists in retrieving descriptions of it. However, societies, like spatial systems, seem to create and reproduce their emergent structures largely by localised activity and, as we suggest below, this may turn out to be theoretically one of its critical properties.

At best, however, all these formulations identify space time mechanisms by which structure is reproduced. They do not deal with structure itself, let alone the emergent structures that appear to come into being as much in society as in space. Yet it is exactly these emergent structures that we need to understand if we are to make sense of the large scale changes in the

spatial and institutional forms of society, such as those brought about historically by urbanisation and industrialisation, which must be accounted for by a theory of society and space. We need therefore a theory which is more than a mechanism for the reproduction of structure: we need to know how space is intrinsic not only to how society reproduces its structures, but also to how society constitutes itself as a structure from local rule governed activity. We must ask then: is there any useful sense in which society is a space-time structure at the level of the emergent whole.

Systems of pure relatedness

Now from the space syntax point of view this is an interesting formulation, because space syntax, whatever else it is, has proved to be an effective method for retrieving descriptions of configurational structure from complex emergent realities. Every proposition that has been formulated about cities, for example, from natural movement (Hillier et al 1993) to the duality of processes generating the grid (Hillier 2001a), is rooted in this extraction of structure from complexity. Since then cities and societies have so much in common theoretically, is it possible that there are also in society structures underlying complexity which might be discussed in the same way ? This would seem to depend on how far it is useful to see society as being, or at least containing, in some useful sense a strongly relational system ?

What might we then be looking for ? We can explore this by following Giddens reasoning a little further. Giddens sees structure in social systems as 'virtual' because we find evidence for its existence only in dispersed practices, in the same way that we find evidence of language structure in discrete linguistic acts. This makes structure look rather weak, little more than rule following. In fact, the cautious view of space-time that leads Giddens to this view seems unnecessary. The very idea of a society implies that at some level situated practices are likely to be connected. Although they appear as discrete events, none can exist in space-time isolation and no collection is likely to form a discrete system, not least because memberships of all situated practices are multiple and every individual passes continuously from one to another in a constant sequence. Each individual is therefore a link between a particular set of - for the most part recursive - situated practises, and all situated practices connect to each other through these changing memberships. Through the interconnection of situated practices, then, the individuals who take part in them construct a large graph of interaction, in which most individuals are remote from most others, but nevertheless have a finite depth from all others in the graph. Seen in a time perspective, then, individuals are linked through participation in situated practices into a continuous system of time-space relatedness. On reflection, it seems likely that the existence of such a system is one of the preconditions for what we name as a society.

This 'system of pure relatedness' can of course be represented as a very large graph, in much the same way as a city is represented as a graph of its spaces. The problem is of course that although we cannot reasonably doubt the existence of the large graph, it is, to all intents and purposes, inconstructible. Even the most ambitious social network theorists, who use such graphs as a primary research instrument, only attempt to construct graphs for relatively finite and bounded socialities. What purpose can then be served by positing the existence of the graph of a whole society, when it is clearly an inconstructible entity ? One possible justification is that in spite of its inconstructibility, it is hard to doubt its theoretical importance. It is after all the global emergent product of the very situated practices that Giddens describes as the primary acts of social reproduction. If situated practices are the *means* of social

reproduction, then the graph is surely its *product*, perhaps its only product. It's existence is a sign, and perhaps the only sure sign, that society exists as a system of interdependent situated practices linked by individuals, or interdependent individuals linked by situated practices. Once the large graph is admitted, it means that individuals are linked not only by abstraction or symbols but by practical space-time activity. On the basis of the large graph we can reasonably claim that society is after all - or at least contains - a space-time system.

In any case, the fact that the graph is not constructible does not means that we cannot know certain things about it. For example, we know that although the graph is very sparse, in that only a vanishingly small proportion of the potential connections between individuals are actually made, from the point of view of indirect connections through intervening individuals, the graph is remarkably shallow. As Poole and Kochen (Poole & Kochen 1978) show in their studies of finding graph paths from randomly selected individuals to others, six steps is probably all you need within national boundaries and only one or two more across national boundaries. This is theoretically to be expected. If we think of those we know, and those that they know, a beneficial combinatorial explosion from each step out to the next ensures that the graph from each individual t0 all others is remarkably shallow - and therefore highly integrated, in space syntax terms - in spite of being sparse.

Even this limited knowledge, allows us to pose an interesting and highly general questions: why should human societies be shallow graphs ? and find a simple evolutionary answer. For societies to be evolutionarily advantageous, all that has to happen is that those who are members of societies have to leave more surviving progeny than those who are not. How do societies do this ? By spreading risk through the setting up of networks of interdependence. If my food supply runs out, someone else can help me. If something happens to me, someone else will care for my children. In evolutionary terms, a society is, at root, a network of interdependent relations which act as an insurance policy.

It is not too far fetched then to suggest that the graph, or rather the network of relations that the graph represents, is what constitutes society in the first place as an evolutionary entity. If we then ask what social interaction is *for*, it is hard to avoid the answer: to construct the global graph, since evolution provides the rationale for its existence. Now on purely theoretical grounds we can assert that a highly integrated graph with, inevtiably, a large number of cycles will be more robust than a tree-like graph, since in any tree every time a link is broken the graph falls into two disconnected sub-graphs. Ergo, a graph is likely to serve its evolutionary purpose to the extent that it is integrated. We note, as a corollary, that a large integrated graph will be better in evolutionary terms that a small one. It follows that we do not need to provide further reasons why societies should seek to grow. It is taken care of by evolution.

Theoretical consequences of the large graph

Let us then admit the large graph as a legitimate theoretical, if inconstructible, entity. What else do we gain by positing its existence ? The answer, we suggest, is that we completely change our view of what a society is by changing our view of it from a local to a global one. If society does after all have a global entity at its core that is critical to its evolution, then its follows that critical situated practices through which the graph is created will be selected for their ability to construct the large graph.

This is a serious cure for localism. It suggests that our fundamental theoretical perspective on society should be at the global rather than the local level. One immediate benefit of this is that allows us to make sense of social phenomena that had previously seemed puz-

zling. For example, if we look at the simplest and least developed societies known to anthropology, small scale hunter-gatherer societies, we tend to find that their local groups, which many expected to exemplify 'elementary structures', are not only highly variable in size but extremely fluid in their composition. Individuals and small groups frequently take an excuse to leave one group and join another, usually where there is a relation of some kind to an apical woman. How can the extreme fluidity of local groups be reconciled to the the sustained existence of a continuous and apparently strong society over a long period ? Why is not the weakness in the local groups reflected in weakness in the society ? The answer is as simple as it is formal. Such societies by definition exist in environments where movement is required in order for individuals to survive, usually with severe limits on how many individuals can survive within a certain area. In such conditions, the large graph is much harder to construct than it would be, for example, in a group of dense villages quite close to each other. However, we can see that the social practices which lead individuals and groups to leave one group and join another, will continually increase the density of connections in the large graph, if necessary at the cost of lower densities in the local graphs. The global graph of the society as a whole thus gains in strength, in spite of the weakening of the local groups. (Lee & Devore 1968)

13.12

Similar mechanisms can even be found in less mobile - though not permanently settled in one place - societies. For example, Turner in his remarkable study of the Ndembu, a village society which moves villages every few years, in which matrinliny in combined with patrilocality, postulates a mechanism which similarly benefits the global society at the expense of local groups. Although the dominant ideology in the society - or at least amongst its males - is one of strong and large local groups under a local headman, in practice the majority of women (77%), having lived with their husbands for long enough to have children, pick a quarrel and go back to live with their uterine sibling group, then 'after a period of ritual hostility', 'form joint hunting parties' with the husband's village. Turner argues that the high divorce rate is one of the fundamental mechanisms for strengthening the society as a whole, since the large scale networks continually gain at the cost of weakening the local networks. As with the hunter-gatherer societies, other institutional aspects of the society can be seen as supporting this prioritising the global over the local.

This is not of course the only way in which societies globalise. If we look at the Tallensi, (Fortes 1959) the society with which Turner contrasts with the Ndembu so vividly, we find they live in scattered but hierarchically structured compounds in which women are spatially deep and men shallow (whereas in the Ndembu case, the buildings that form the circular village are simple huts). The Tallensi kinship groups remain in the same location through generation, and have deep attachments to their specific locations. In Tallensi society, the large scale network of the society is created not by movement between groups (women in particular are relatively immobilised) but by a complex system of ritual erected on the basis of an elaborate and hierarchical system of kinship, supported by an ancestor cult, and dominated by men. This forms an overarching structure which links relatively immobilised and localised groups of women, and it is largely realised through ritual interaction patterns which are confined to men. In this case, in contrast to the Ndembu, the integration of the large graph will be primarily through men, and largely through the realisation in space time of highly ritualised and exclusive practices rather than through movement

In each of these case we see that both the local and the institutional nature of the society is bound up with the social practices that create the global network, and is unintelligible without it. We also see that that the effect of the institutionalised practices in each society is to create the global network, though in one case strengthening (and rendering asymmetrical) the local networks and kin the other of weakening them. In evolutionary terms, in both cases the institutional practices that have become selected for seem to be exactly those that create the global network. We can say little about why one society takes one pathway and another takes an entirely different one, and it may be that we do not always have to do this to understand the morphology of a society. There may be specific historic causes, but it could equally be a matter of different responses to similar ecological conditions with some element of change. However, in evolutionary terms, a general mechanism may be suggested. If the large graph is created in the first instance by certain specific local practices, perhaps through a restricted random process of some kind (Hillier 1984) then to the extent that the the structure of the large graph is to be reproduced the local practices which created it will need to be reproduced. To the extent then that the system reproduces itself, the local practices will become normative in the system, if for no other reason than that they are the means by which the large graph is reproduced. This process would depend on the mechanism of description retrieval discussed earlier, that is the ability of human being to retrieve an abstract description of spatio-temporal events and use it as a template for further action. Retrieved descriptions from practices which had the effect of reproducing the emergent system would in effect become normative to the degree to which the system was reproduced. There would seem to be no reason in principle to insist that the social practices that support the graph are antecedent to the graph. They may equally arise from the process of graph construction itself.

Suppose then that we tentatively define society as the large graph of pure relatedness plus all that it takes to produce and reproduce it, that is, all that it takes in terms of 'hardware' of situated practices and the social software that supports them. From the point of view of the society-space relation, this is interesting, because it means not only that a space-time entity exists at the heart of society but also that the existence of the graph mean that space has been overcome to construct an entity at the level of the society itself, above the level of individuals and proximate groups. We have seen in the few illustrative cases given above that how the society overcomes space to create the large graph may well be a useful clue to the morphological distinctiveness of that society.

We see also that the technology of production may relate to the ways in which societies overcome space by creating the initial spatial conditions - for example of aggregation or dispersion - in which space has to be overcome. Thus a hunter-gatherer societies has to overcome a degree of dispersion based on so many people per square kilometre, the Tallensi have to overcome place fixity of a rather dispersed kind, and so on. This suggests the possible form for the fundamental relationship between technology, social institutions and space which have all been intertwined in the series of historic transformations of human society, in that the initial spatial conditions determined largely by the technology of production place constraints on the kinds of society that can develop through the interaction of space and institutions? Might there, indeed, be something like lawful pathways for the overcoming of space, linking the situated practices and social social software to space. To to this, paradoxically, we must first think of the graph in its relation to time

Time and the large graph

Let us look a little mote closely at possible mechanisms. Overcoming space means that a certain set of global relations in the network have to be created and realised in space, over and above those that arise from everyday productive activity. This implies movement. In some cases, as we have seen, this movement is created by some rather minimal social software permitting mobility between groups, in the form of rules that ware both permissive, in that it did not require but allowed things to happen, and probabilistic, in that it was taken up opportunistically by a given - though substantial - number of people. In others, we we find much more elaborate software which is both more constructive, in that it requires certain things to happen, and more restrictive, in that (as with the Tallensi) it specifies that men move but women don't. The global movement patterns that realise the large graph in space time thus are far more rule governed in some cases that in others. How do such differences relate to theoretical possibility ?

13.14

Let us first consider the issue in principle. If we think of individuals scattered in a landscape, and of the movement required to create and reproduce graph relations, then we immediately see that there will be a simple law by which the probability of encounter is inversely proportional to distance. Other things being equal, I am much more likely to encounter those near me - or rather to those near to my daily path of 'effective spatiality' - than those farther away. This is interesting, since it suggests that for the global graph to be constructed, something like a natural law has to be overcome. Without some kind of social software, it seems likely that graphs would degenerate into localism. What kind of social software then can in principle operate to create a large graph ?

We can explore this taking advantage of one of the fundamental concepts of space syntax: the justified graph, or j-graph. A core idea in space syntax is the concept of the graph whose elements are its j-graphs, that it, its positions from which the whole graph can be seen and be found to be different. The fact that there are such differences is not only the foundation of the idea of structure in space, but also the basis of quantifying that structure: integration measures quantify what the graph looks like from each of its j-graphs; representations of structure are colourings of the pattern of differences in j-graphs, and so on

In societies, since the large graph links all individuals into a network that is eventually connected, it follows that each individual can be conceptualised as a j-graph of the large graph, that is as the root of the justification of the graph from the point of view of that individual. One useful implication of this 'extrinsic' characterisation of individuals is that the individual and society are defined by exactly the same structure: an individual is a particular position from which the whole of the graph can be seen. Individual and society are then no longer polar concepts, but different ways of looking at the same thing. This also means that we can to a useful extent reason about the graph as a whole by reasoning about its j-graphs. Once again, it turns out that we can know useful things about j-graphs even if we cannot construct them, and find out how space gets out of the graph and into the social software.

Let us now return to Giddens. A society, he argues, reproduces itself by producing itself in space-time through rule-governed situated practices which thus, language-like, reproduce those rules. There is a corollary to this: that *what is not produced and reproduced in space-time is no longer an effective part of society*. There is between the abstractions and the spatio-temporal events that make up society a kind of *law of sufficient embodiment*: in the long run, *no co-presence, no relation*. This can be simply illustrated from our own experience of the way in which

kinship relations decay, and no longer form part of effective networks, usually as a function of both real and logical space, in that, say, remote cousins who live in another part of the country, are no longer an effective part of networks and become forgotten. If we do not retrieve a description of these relations and re-embody them in space-time encounters, then these relations are not longer reproducible part of the social graph, though they may remain latent for a long while. On the other hand, an encounter which occurs unintentionally, that is without prior description retrieval (as is more likely in conditions of spatial proximity), will itself constitute a description retrieval event. The pair description-retrieval/interaction can occur in either order.

The relations that constitute a j-graph (and of course the whole graph) are then not only continually changing and being replaced, and also being foregrounded by interaction and gradually fading into the background through inactivity. The periodicity of recursivity is critical. Every j-graph relation varies on a dimension of recursive realisation from frequent to never. The farther along to the never level the more *virtual* the relation is, that is, a conceptual or potential relation rather than a 'real' one (though of course it may suddenly be realised again). Every j-graph then contains relations that go from real to virtual and each *time frame* will have a *sub-graph of real relations*, and the *real plus virtual* j-graph is the *total* j-graph.

As soon as we distinguish periodicity in time, a fundamental distinction which is found in all societies, comes into view, which we can see by examining individual j-graphs. Each individual j-graph will reflect relations generated recursively through the *effective spatiality* of everyday existence, whether the individual is a hunter-gather or an office worker commuting from Chalfont St Giles to High Holborn. These relations in the graph, weak and strong, will be generated as a by product of co-presence generated by how individuals produce their everyday survival through productive activity and its associated technology. Second, the graph will reflect *relations which are generated by the the need to reproduce the graph itself*. This may sound odd at first, but it is a key distinction. In all societies a distinction can be drawn between activities whose object is the biological survival of its members, and activities whose object it the production and reproduction of society, for example, the special activities associated with major life events such as birth, coming of age, marriage and death. *In the first case, the graph is the by-product of the activity, in the second the graph is the object of the activity and so is in a sense is its product*. This distinction corresponds to what economic anthropologists have call the 'replacement and 'ceremonial' funds (Wolf 1966), the first being the proportion of human resources and effort devoted to reproducing the ability for individuals to survive biologically, and the second the proportion of resources devoted to biologically useless activities whose object is to produce and reproduce society.

For a theory of space and society this distinction cannot be too highly emphasised, since it is involved in every phase of how societies create and recreate themselves in space, and thus overcome space. In the first kind of activity, which covers the - necessarily spatial - conditions of everyday life in which individuals engage in 'work', relations in the graph are *generated* through an activity which has another purpose. The graph arises because work happens and creates interactions which may or may not be reproduced within the work process. Everyday activity aimed at everyday purposes can then be said to be *generative* of the graph. In the second kind of activity, which covers the special activities in which individuals engage which do not have biological survival as the direct aim, and in which the graph itself is the object of attention, relations in the graph are *conserved* through realisations which are designed to

achieve just that. Such activities are thus *conservative* of the graph. This is what we mean by ceremonial activity, whether simply inviting people to dinner or engaging in some large scale social ritual: its aim is to reinforce and reproduce the graph through activities in which the content of description retrieval of relations in the graph in manifest and dominant. This is what we mean by, say, a marriage ceremony or a coming of age ritual.

Ceremonial graph-conserving activities are thus distinguishable from everyday graph generating activities by their degree of deliberate descriptive content. The content of a ceremonial or ritual activity is subject to a greater multiplicity of rules governing what happens, including who does what and in what sequence than will be found in everyday life. This is in its nature, since its object to describe with great emphasis and re-embody in space-time key relationships in the graph. We can formalise this by working out the number of rules that are required to make the event happen against the number of activities that actually happen, a kind of rules-over-events ratio. The higher the ratio of rules to events, the more we would say that the activity is 'ritualised'. We can therefore say that the description required for a ritual is a long one, in extreme cases as long as the number of events taking place, since nothing can happen unless it is specified by a rule. We can conveniently call such activities 'long model' in that they depend on a long description to ensure that they happen in the proper way. In contrast, we can immediately see that everyday activity tend to be 'short model', in that insofar as its objectives are practical rather than ritualistic, it will only be effective to the degree that the actor is free to carry out the necessary activities in an unencumbered way as possible. (Hillier 1996a) We thus find a fundamental relation between time and social software. In normal circumstances, short model graph-generating events have a short periodicity, long model graph-conserving events have a long periodicity. A fundamental dimensions of difference in what we might with some licence call universal social software is therefore bound up with time.

13.16

How space gets into the social software

However, it is even more powerfully linked to space through the fact that time is linked to space through movement. All movement occupies time, and all encounters depend on some degree of movement. The question is: what degree ? In terms of the relation between movement and encounter there is a profound difference between local (in terms of the effective spatial pathways of individuals) and global space. In local space encounters happen through the agency of space itself, and such encounters can either produce new relations in the graph or reproduce existing ones. In local space, encounters happens with little effort, and there is no reason for anything more than the minimum of rule structures to bring it about. If we find complex rule structures, or long models, in local space then, as in the case of the Tallensi compound, then they are likely to be about restricting encounter rather than generating it. In its natural state, local encounter is short model.

Encounter over distances is quite different. At the very least, a distant encounter will normally need be aimed at a specific object, a destination that must be specified in advance. Precisely because the probability of encounter is inversely proportional to distance, a distance encounter need a greater degree of conceptual organisation than a local encounter. As usual, we find these ideas still pervade our unconscious assumptions about everyday life. For example, we assume that an impromptu invitation is much more easily issued to someone who is local than someone who must travel a distance, and that more formality is required if a greater distance is to be overcome to make the encounter happen. We thus find that another

invariant aspect of social software is that, complementing the inverse laws linking encounter to distance, we find another that *link distance directly to the length of model*. Events which are rarer in time are also normally more distant in space. We therefore need the greater conceptual organisation of the longer model to bring about encounter over greater distances, and this increases with distance.

However, there are two kinds of distance: real distance and social distance. Longer models are found where either is to be overcome. For example, a person in the local domain whose status is asymmetrical to others, will have long models associated with interaction, since the need is for social software that restricts and structures encounter in a domain where it may other wise happen by chances and in an unstructured way. This is fundamental to the ways that certain kinds of buildings work: space is structure to conserve formal relations by preventing spatial proximity turning them into onformal ones. We can now see a natural morphological logic in the comparison between the Tallensi and the Ndembu. Among the Ndembu, we find greater equality between men and women and a less asymmetrically structured society, because the large graph is prioritised over the local graph and is created by the short model movement of women away from the husbands and back to their uterine sibling group. This solution to the large graph problem by movement means that the local short model is pushed outwards to form the larger network. Among the Tallensi, the contrary is the case. The large graph is created not by short model movement by long model movement based (the shrines are remote form compounds) ritual activity of men based on the lengthening of the model of the kinship system (descriptions of lineages are retrieved much farther back among the Tallensi than the Ndembu) which excludes women, who have more localised but also much more structured spatial lives. The Tallensi therefore can be seen as extended the long model downwards from the global to the local level. The Talense-Ndembu contrast thus become pair of morphological opposites, extreme cases of two ways of creating the larger graph.

This is how space gets into the social software. The key items of social software are the about space as well as time: on the one hand longer models are needed to overcome space to create the global graph; on the other, they are needed to control the effects on graphs of spatial proximity. In other words, we need long models to overcome distance and to controlling proximity in the reproduction of graphs, and and we need short models to generate and sustain graphs in the first place.

Urban societies

What then happens when these initial spatial conditions that create the kinds of societies we have so far considered no longer prevail, for example, when societies aggregate to form the large continuous and dense settlements that eventually become cities. Why do spatial and social changes seem to happen together ? and how both relate to changes in the technology of production: to quote Wirth 'The central problem of the sociologist of the city is to discover the forms of social action and organisation that typically emerge in relatively permanent compact settlements of large number of heterogeneous individuals' (Wirth 1938) Let us first add a problem. There is something approaching paradox in our historic idea of the city. It seems to be at once the locus of domination, social classes, bureaucracies and enforceable law. On the other, throughout history it has seemed to be the place of freedom. It it possible that both of these effects are once once a product of what the city is ? As previously, we will not try to explain either the changes in the technology of production that are associ-

ated with cities or why and how it creates specific spatial conditions. We will taken the spatial condition of dense aggregation for granted and try to understand its implications for the construction of large graphs

First, from the previous paper (and its predecessors) we already know a good deal about the impact of space in large dense aggregates: a vary - but sometimes intense - pattern of co-presence is generated through the effect of spatial configuration on movement. How is the large graph likely to be affected by these very different initial spatial conditions. ? We saw that under dispersed conditions, the problem of creating the large graph was a problem of overcoming the distances between relatively small local groups, that is, it was largely a problem of creating co-presence through movement in spite of dispersal. What then is the effect of the replacement of those initial conditions by the conditions in which co-presence is much more freely available ?

First, let us consider are the institutional changes commonly associated with the rise of cities against this change in the background condittions. A vast literature suggests, with reasonable consensus in spite of exceptional cases, at least three main changes. First, a substantial division of labour amongst individuals appears to replace small group self sufficiency. Secondly, space-based supra-local organisations with a predominantly political character and the ability to settle disputes according to agreed law take the place of supra-local organisations based on the elaboration of kinship structures which lack significant dispute settlement functions and are articulated largely through ceremony. Third - and this is much harder to define - the notion of the psychologically free individual takes the place of the highly constrained social member whose group identity is of greater social importance that individuality. Why should these be the outcome of the transformation of space ?

The first, the emergence of an individual division of labour, is not difficult to relate to the spatial transformation. An extended division of labour amongst individuals, and the intricate pattern of day to day interdependencies that this creates, is inconceivable without the integration of space and the high levels of natural co-presence it makes possible. We cannot say that the division of labour is caused by spatial integration, but we can say that if there are economic or evolutionary reasons in which this division of labour is advantageous, configurational integration creates the necessary spatial conditions in which it becomes viable. A division of labour amongst individuals become ineffective to the degree that distances between specialists become greater.

The rise of space based political institutions is also closely connected to the transformation of the spatial basis of society, though the relation is less obvious. In pre-urban societies the task of supralocal organisations was to overcome the distances between the groups and create the larger scale society out of spatially dispersed groups. The raw material for this was the kinship system which already creates relations across space, usually supported by the exchange of people between groups through marriage and other alliance creating acts. Supralocal organisations in these spatial circumstances tend to raise the kinship system to a higher level and embed this back in the society through ceremonial organisation. This is why dispersed tribal societies often have higher levels of ceremonial organisation than urban societies, with a greater presence of supralocal ceremony into everyday life.

Under the spatially integrated conditions arising in an urban society, the problem for supralocal organisations is different. We have already seen that space gets into the social software by creating rules on the one hand to overcome distance and on the other to control

the effects of spatial proximity. In pre-urban societies, the first of these is much more important than the second, since without it the global graph would not exist, and the second arises as a reflection of the modality of the first. In densely aggregated societies, the second take priority over the first, not only because the compression of space has made larger graph resources available much closer, but also because the problem of controlling the effects of proximity has become more important than the problem of overcoming distance. In dispersed societies, when disputes occur, the common solution is either fission (Sahlins 19xx) or the formation of kin-based alliances to redress the situation. Under urban compression, the potential for disputes is statistically much greater, and by definition the fission solution is no longer available if the dense society is to evolve.

In practical terms, it means that the ability to settle disputes within the spatial realm and prevent the graph from breaking up has become more important than the need to construct the graph across distances. In terms of the language of description retrieval (which, as will be seen in another paper, is the fundamental language of the graph), we can say that the need to control and negotiate descriptions in the continuous spatial milieu has become more important than the need to embed descriptions in ritual in order to create the large graph. A 'political' organisation is one which specialises in the negotiation of descriptions, a 'legal' organisation is on which specialises in the control of descriptions. It is such organisations that are then selected for in the new spatial conditions created by dense aggregation. The problem of distant relations has not however, disappeared, but reappeared in the form of the need to relate a much larger aggregate to the wider system including the urban hinterland and the other settlements in the wider system of which the city is part.

These factors impart to supralocal organisations a character which is not only political and legal but also space-based, both in the sense that it must operate within a spatially continuous local system, but also in the sense that it must relate this system to other spatially based systems in its vicinity. We can say then that whereas under dispersed conditions supralocal organisations create society in spite of the lack of spatial integration, and therefore use primarily ceremonial means, under urban conditions they create society in spite of the presence of spatial integration by dealing with the problems its creates, using primarily political-legal and space-based means.

It is the change in the institutional structure of society in response to spatial changes with then creates the third phenomenon: the emergence of the psychologically free individual. This is normally assigned to the dramatically increased co-presence resulting from spatial integration changing the everyday experience of others from social recognition to anonymity, and discussed in terms of the flawed discourse of the 'myth of historic spatiality' as some form of alienation or desocialisation. We propose a deeper cause, arising from changes in the interpenetration of the spatial and supralocal aspects of society. In a pre-urban society social institutions work on the raising of kinship network into a larger scale conceptual system, so that these become the most important aspects the global organisation of society. This means that the burden of reproducing the large graph is carried largely through what people do, how they think and how they behave. The load of reproducing institutional structures is carried through individual minds and individual behaviours (though forming collective patterns), and in this sense the individual in a preurban society is much more a mental prisoner of that society.

In the spatial conditions created by the city we find not only that institutional structures have become transformed, but also that they have become spatialised in two senses: first they are located as built forms in real space, usually in significant locations in the urban fabric, but also in the sense that their sphere of influence is now the ambient space itself, not simply the abstract realm of social software that served to create the momentary space-time events that reproduce the large scale structures of the graph in preurban societies. Social institutions are in both senses taken out the fabric of individual life and made extrasomatic. Institutional structures, in effect, are externalised from people and become an outward pressure bearing down on them, rather than an internal force that structures their thought and behaviour. Although they act as external forms of control operating on the individual through the control of ambient space, they also liberate the consciousness of the individual, and turn him or her more fully into a social individual more than simply a social member.

It is not that individuals do not occur in preurban societies. One remembers the remarkable - and highly spatial - commentary of Lienhardt (quoted by Mary Douglas) on the Dinka-Nuer and the Anuak: '*The frequent dispersion of the Dinka-Nuer as compared with the concentration of the Anuak, may be associated with the much greater interest shown by the Anuak in individuals and personalities. They have an extensive psychological vocabulary, and their village politics.....are conducted through an interplay of character as well as of faction. Anuak are interested in people, Dinka-Nuer more interested in cattle*'. But in the city, the creation of extrasomatic institutions frees the mind from the need to use its network simply to reproduce the existing structures of the graph, and sets the scene for kind of nonlocal networks based in choice of the kind which Fischer (see below) describes as characteristic of present days cities, but which have probably always been one of their prime assets. The extrasomatisation and extra-mentalisation of institutional structure within a context of intensive spatialisation that is the prime sourse of the individuality that seems to be associated with cities, and we can note that it arises from the same patialisation of social forces through which class asymmetries and bureaucracies also arise. The city itself becomes the extrasomatic mind, and this frees the internal mind and makes it creative.

13.20

What then happens to the large graph and its constituent set of j-graphs in the context of the city ? Let us look more closely at the studies of Fischer (Fischer 197x) on social networks in contemporary cities. As a result of his investigation of networks, Fischer is highly critical of the tendency of previous investigators to focus on the local properties of networks, that is such properties as density (if a knows b and a knows c then b knows c) and multiplexity (if a know b because he is his brother in law does he also know his as his butcher). He sees this as part of what we have called the 'myth of historic spatiality', in which the present is believed to be alienating because individuals lack embedding in dense and multiplex local networks. Fischer's view is that if people had predominantly local networks in the past, then it was because they could not escape from them. Compared with this enforced localism, networks in the modern metropolis were of higher quality, more dependable and perhaops also more extensive, because they bare formed by choice and affection rather than dependence on locality. Fischer's work is one example of a growing group of studies that suggest that the more global - or perhaps globalising - aspects of networks may be more critical than the local.

We cannot of course get social network information on historic cities, but we can reasonably conjecture certain likely properties of j-graphs from knowledge of living patterns and institutional structures. For example, if we take a late mediaeval mercantile city like London,

an typical individual would be a member of numerous different networks which do not correspond to each other and may barely overlap. For example, during the working day the citizen would through his or her part in the division of labour be part of network of making, distributing and trading, that is, what Durkheim called an 'organic solidarity. Also through the division of labour he or she would be a member of a guild, which would make links into a quite different network, one more like a Durkheimian 'mechanical solidarity'. In all likelihood he or she would also be a member of a religious grouping, and of a family network, which again would make links to different groups. Far from being multiplex and dense, the citizens j-graph seems to be based on multiple overlapping memberships which have the opposite properties. Such graphs may surely be seen as globalising rather than localising. At the same time, we would expect that the mechanisms for regulating locally co-present relations would be reinforced, giving rise to the familiar urban theme that socially successful people rarely network with their neighbours.

The typical urbanite is then one who globalises networks. Dependence on purely local networks is surely correctly taken to be a sign of underpriviledge and lack of social power, while at the other extreme, those with the most global networks are also likely to be those with most social power. We can see how cities will tend to create the full range of local and global networks. However, in general we can see that *cities are machines for globalising networks through multiple memberships*, and regulating local networks to cope with the strains of co-presence. The urbanite is successful to the degree that he or she succeeds in the globalising game. In the last analysis, this all seems to be the morphological consequence of the integration of space, and again we are reminded that it is the globalising rather than the localising aspects of social software that are critical to understanding the society-space relation.

In many senses, then, the social nature of cities seems to arise in quite a natural way not only from the fact of aggregation, but also from the form of aggregation. The social city would be inconceivable without the fundamental network of linear spaces that link all parts of the city into a unified and structured network of movement and co-presence.

So what is happening now ?

So what can be learned from all this about what is happening now ? Because what is happening how is, we believe, unintelligible without an understanding of what happened in the last major transformation of cities, that associated with industrialisation, that we must give some background one this before looking at the present.

First, we must review our theoretical lessons first about cities:

- although cities as systems of built forms and spaces are driven by economic and social processes, they are not infinitely plastic in the forms they take, but evolve under the constraint of spatial laws governing both the emergence of spatial forms and the effect of these on co-presence;

- the relation between urban life and the city as object is as a result generic not specific, reflecting the generic nature of the relation between space and society rather than the idiosyncrasies of history;

- space, and most notably city space, does not just take its shape from the society, but answers back and affects society, even changing its deepest structures.

and then about societies:

- all societies are *global* (though obviously not on the same scale) in that the global graph is the spatio-temporal sign that a society exists, and *virtual* in that they operate on social software of different kinds to create their graphs in different spatial circumstances;

- a society is how it overcomes space to create its large graph, and the tendency of individuals j-graphs is toward the global graph, at least as much if not more than to the consolidation of the local graph

- the effect of the technology of production,including the patterns of effective spatiality that it requires, is to create the initial spatial conditions in which society, the large graph and the software and hardware through which it is realised, can be created

What then do we learn about the here and now, unencumbered by the myth of historic spatiality. First we can define certain questions that the theory suggests might be critical:

- what are the new spatial preconditions on society imposed by new forms of production

- how will they impact on the two way genericity of the city

- will the distinctively urban dynamics that we have described continue to prevail, or replaced by others

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First, let us review the effect of industrialisation on cities. It clearly created, through a new technology of production, new spatial conditions in which a society had to be created, at least for some people. In practical terms, the factory system meant the rapid agglomeration of large number of factory worker in new and rapidly growing urban agglomerations (some new, some extensions of existing ones) brought a large number of people into the city who were cut off from their previous social embedding, and did not obviously fit into the social and spatial patterns of the preindustrial city, not least because under the factory system the artisan was separated from the tools of production, and no longer had the material basis for the urban memberships we have described.

One outcome of this was an excellent example of our model in action: social thinkers saw that a new society had to be created for the people brought together under these new spatial conditions, and a series of fantasies and experiments were proposed (and many carried out) for spatially redesigning society into order to achieve a pacified social system. (Hillier 1984) These fantasies, which all involved the disaggregation and dispersal of the city into smaller self contained components, were deeply influential in the intellectual origins of modern town planning (Benevolo 1967) and were a key factor in creating the overlocalised thinking that has prevailed since then in the spatial disciplines.

Other outcomes were equally well known. We saw the auto-generation of space based urban communities of the kind reported for the East End of London (Willmott and Young) and the West End of Boston (Michelson 1976) and now duplicated in informal settlements in cities around the world (Hillier et al 2000). Large numbers of middle class people who had previously inhabited the more central or inner suburban areas of the city moved to the outer suburbs and the countryside, and a programme of spatially controlling the poor urban population was initiated first by buildings closed urban enclaves in city centres in place of streets (Hillier 1984) and then seeking to 'thin out' the urban population (i.e. get rid of the poor) by 'decanting' them into new dormitory towns (including, eventually, the English new towns programme). In less advanced industrial countries this was comple-

mented by a programme of re-engineering the grids of city areas to make them fit for largely middle class populations (Haussmanisation, Cerdaisation and so on). These issues are dealt with in the Postscript to (Hillier 1984).

It is of theoretical interest, that this programme of deliberate urban disaggregation and amelioration was perhaps the first time that a programme of creating a society under new spatial conditions imposed by technological development was a conscious, discursive process. No such fantasies are proposed for whatever change in spatial conditions is currently under way, and this may itself turn out to be an interesting fact. But what is the current process. First, at a descriptive level, we are seeing a dual movement in and out of cities. People are still leaving cities, as they have done for many decades, but others are coming back. Most cities now report a quite rapid recolonisation of old city centres, for the most part by those seeking a street based lifestyle - gentrification is essentially a house-on-a- street process, and usually back to houses originally intended for people like them, but which had in a previous era become de-gentrified, but also by the construction of high priced inner city enclaves in some areas. Many cities, and not just in the western world, also report a rapid intensification of street life in cities, in many instances reversing a long standing trend the other way.

To say the least, this sits uneasily alongside the theories that propose that modern communications technology means the end of cities as we know them. What we are seeing seems to be a straightforward revival of urban living, in many sense apparently simply reversing the outflow that took place over the last century. If this does turn out to be the case, how could it be explained ? Who is going where and why ? And will it fit into cities more or less as they are ?

The answer must start form trying to understand the change in the 'initial spatial conditions' that are now being imposed by new technology of production. What exactly is the change ? At the risk of serious over-sinplification, could we not suggest that what is happening now is something like an inversion of the change that happened under industrialisation ? Then, the changing technology of production brought into cities large numbers of desocialised, de-tooled and disadvantaged people to man the new system of production. The flight from the city was of a smaller number of traditional urbanites (so that cities still grew rapidly overall), and presumably this was associated with the de-gentrification of some urban areas which are now re-gentrifying. Now we are surely seeing something like the opposite: the dispersal of low level production and services away from major connurbations, and the aggregation of high end knowledge production in and around cities, especially their centres. It would be expected that under these initial spatial conditions there would be a two way flow both in and it of cities.

But what exactly is driving the flows ? First, the leading edge change is in knowledge industries, and the new activity types that are being created are to do with the creation or transformation of knowledge in some sense. The dispersed productive activity is new in its contents, but it is not a new type of activity. Under industrialisation, the leading edge change in activity was not in the the knowledge that led to new forms of production, but in the material fact of production itself. It was this that created the spatial conditions in which society had to operate. We could say that compared to the nineteenth century the leading edge of activity change has moved from the hardware to the software of production.

Why should this lead to an inflow into cities ? There is a work related and residential aspect to this argument. The first is that knowledge generating industries - and to a less extent knowledge rich industries - are buying into integrated space for reasons which are as profound as those which first associated the progressive division of labour in cities with the integration of urban space. It is more than twenty years since Tom Allen of MIT showed that the intensity of contact between R&D groups was positively related to innovative performance, but intensity of contact within groups it was not (Allen 1977). It is about ten since space syntax research showed that increasing useful contacts between groups resulted from the way in which layout configuration related global movement to local working patterns. (Hillier & Penn 1991) (Backhouse and Drew 1992)

The reasons for this apparent relation between space and innovation are simple enough: in innovative knowledge generation you are more likely to make unexpected links by talking to those working on other problems, than by continuing to talk to the same people. The potential of a new idea is greater if it comes from a greater conceptual distance and this is more likely if you talk to people who do not share your problems and your take on things. Space can create the conditions in which this becomes more probable by making it more likely that you will talk to people you don't know you need to talk to. This is why innovative thinking benefits from a relatively random and rich background of encounters and suffers in an over-organised or hierarchical one. It is not the relations within the group you work with that needs to be reinforced, but relations between groups. Again, it is an argument for globalising rather than localising graphs. In this it perhaps resembles the original development of the division of labour in cities. This similarly depended on something like critical mass in the graphs at a nonlocal level. Indeed it is likely that as Gordon Brown has suggested (Brown 198x) the integration of knowledge generating space itself both promotes and benefits from a progressive development of an interdependent division of knowledge related labour. The grounds for seeking the integration of space for knowledge creating and knowledge rich activities are therefore as profound as those which originally took place in historic cities.

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But why should this also lead to a resurgence in urban living ? There could be an equally simple answer: for the traditional urban reason that cities are not about creating localised networks, but about globalising networks. More precisely, urban living allows, as it always did, the putting together of the middle to long range networks which are an indispensable adjunct to the knowledge creating society that grows up alongside the knowledge creating process, for the kinds of reasons showed by the classic studies of Granovetter in which he showed that it is not the immediate network of strong ties that give the critical information about work opportunities, but the looser network of what he calls 'weak ties'. Again, the larger scale network is more critical to the individual than the local network. Put at its simplest, if you are an upwardly mobile part of the growing knowledge industry, you can hardly afford to be out of the city. The risks to your j-graph would be too great. The city still operates as a machine for globalising graphs. Why then are others still be leaving ? Again, there could be a simple answer: because the leavers are not part of the leading edge of the new technology or the new society, and so are still working under the old paradigm of escape to the suburbs and the countryside. They have not yet become part of the new society.

How will this new pattern then fit, or fail to fit, into the existing city ? We have specified a microeconomic process that requires integration, and a residential process that requires some degree of integration. As we have seen, the process of 'gentrification' the world over is led by the traditional 'house on the street', although in difficult areas for 'urban pioneering' we still see the implantation of enclaves, perhaps to facilitate the process in the short term. In other words, the new kinds of activity generated by the new spatial conditions of production seem to be calling into existence something very like the traditional city as we described at at the start of this paper. In other words, the criteria we suggested earlier for the absorption of new activities into an existing framework seem to be fulfilled, and this seems to be confirmed in the case study reported in Appendix 1. This can hardly be the end of cities as we know them. It is surely another new beginning.

Appendix 1:
A case study in fast and slow change

This is a simple example demonstrating both how the fast rate of change in urban activity patterns is absorbed by a slow rate of change in spatial form, and how the existing spatial pattern of the city acts constructively as a generator in bringing about new patterns of spatial culture within a largely unchanged urban fabric. The case is the historical transformation of the City of London over three hundred years from an urban community based on guilds and face to face exchange mediated by an intricate and dense system of streets and alleys, to the current financial centre where most business is conducted by computer and behind closed doors. (Hanson & Hillier 1993) How has the city as city responded to this transformation of its spatial culture, and what, if any, is the effect back on this life ?

Figure 1 is a black on white representation of the space of the City of London as it was in 1676 shortly after the great fire, and Figure 2 is its analysed axial map. Figures 3 and 4 are the same for the City in 1989. Let us first look at the changes to the urban space, leaving aside at this stage the dramatic increase in buildings heights and densities in certain parts. The differences are quite systematic and diffused throughout the system. For example, the number of convexly distinct spaces has reduced to about half, as has the number of axial lines. The number of dead end lines has reduced to about a tenth of what it was, but the number of through lines has also reduced. Also the number of built form 'islands' has reduced by about a quarter. Geometrically, the spaces have become considerably wider, and lines are on average substantially longer. There are three major new streets - England's answers to Haussman in the mid nineteenth century - forming a triangle meeting at the syntactic centre. Overall, the system has become much more syntactically integrated, and more intelligible and, in spite of the overall reduction in the number of blocks, more permeable.

We also find that the 'two step logic' of the city is conserved and even improved. This means that at the global level, is you enter the city by one of its gates and follow at each stage the longest line you can see, then you will see the centre somewhere from the second line. At the local level, it means that if you depart from a main line into a shorter line into a back area, then the second line you use will show you either the way out or an important internal destination. It means, quite simply, that it is hard to get lost, because both at the global level of the whole city and at the local level of its small scale sub areas, the city has the kind of centre to edge structure that we saw in our earlier examples. The effect of this is that the city works to create strong probabilistic interfaces between those moving in and out of the buildings and those moving past, and between those moving in the larger scale system and those

moving in the smaller scale local areas. The city construct in effects a series of probabilistic interfaces between scales of movement, so much so that we can be sure that its has evolved in order to create this kind of pattern of co-presence. The need to interface scales of movement is the situational constraint that has governed the process by which the urban pattern has emerged.

It is easy to imagine how this local and global space structure would have supported the face to face commercial community which occupied the city three hundred years ago. But how does it work now ? The fact is that it works in more or less the same way, but with a quite different social embedding. One has only to spend time in the city of London to realise that it has an extraordinary spatial culture. Those who work in the city go out into the streets, especially in the midday period, and use public space for eating, drinking and socialising. In the recent past, this has been substantially added to by the building of highly successful new public squares, whose use now often extends well into the evening. In some cases, new experimental designs of public space offer new kinds of urban experience by engineering new kinds of co-presence. For example, Broadgate's Exchange Square creates a number of focal spaces within the same large space so that the different groups which congregate in its various parts are all in visual contact with each other. The effect is exhilarating, and generates a substantial amount of interaction through this engineered co-presence.

How should we then understand this ? The system of public space is still being used in generative mode, but not so much as a direct support for face to face business activity, but to create an emergent spatial culture which in every sense stands in contrast to and thus complements the business activity. For example, while business activity behind closed door is oriented towards gain, the sociality of the public spaces is oriented to gift exchange and conspicuous consumption. The situational constraints that hold this evolving system of public space in place are to do with the construction of a complementary sociality, to bring together in society what the business activity divides and brings into conflict. Space thus plays as powerful a social role as it ever did, but in a different modality. It constructs an expressive rather than instrumental sociality. More practically, the distinctive 'spatial culture' of the City is a prime component of the famous quality of life which draws both individuals and organisations to the city. The new sociality has economic consequences.

Why has this new lived sociality emerged ? It seems unavoidable that part of the answer is simply that the spatial and co-presence preconditions which it requires and which can generate the co-presence conditions in which it can emerge were already in place. Spatial culture is endlessly created and recreated by the spatial and institutional conditions which we impose on ourselves. It is a perpetually emergent phenomenon, arising from the fact of co-presence and the fact of society. What we have to understand is how it is structured, and this can only be in terms of how spatial conditions provide the co-presence raw material within which different spatial cultures will emerge. The city itself creates its spatial culture.

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