Creating Life: Or, Does Architecture Determine Anything ?

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Summary

As far as spatial layout is concerned the question of "architectural determinism" has two components: does spatial layout influence the pattern of space use and movement? and does this patterning of "spatial life" have social implications? In this paper, an attempt is made to answer the first question by, first, using space syntax to analyse generic properties of a large sample of towns and urban areas; and second, using the hypotheses derived form this analysis to explore the relation between spatial layout and movement patterns in a sample of real case studies of urban areas and housing estates. It is argued that the results show that spatial layout in itself generates a field of probabilistic encounter, with structural properties that vary with the syntax of the layout. Finally, it is argued that this encounter field may be a more important social and psychological factor than has been allowed.

Résumé

Pour ce qui est des plans urbains, le "déterminisme architectural" soulève deux questions: le plan urbain influence-t-il le modèle de l'utilisation de l'espace et du mouvement ? et cette modélisation de la "vie spatiale" a-t-elle des implications sociales ? Dans cet article, nous essayons de répondre à la première question en utilisant tout d'abord la syntaxe spatiale pour analyser les propriétés génériques d'un vaste échantillon de villes et de quartiers urbains. Nous utilisons ensuite les hypothèses qui ont émergé de cette analyse pour explorer la relation entre le plan urbain et les modèles de mouvement dans un échantillon d'études de cas réels de quartiers urbains et résidentiels. Les résultats montrent que le plan urbain génère en tant que tel un champ de rencontre potentiel avec des propriétés structurales qui varient selon la syntaxe du plan. Et enfin, il s'avère que ce champ de rencontre peut être un facteur social et psychologique plus important qu'on aurait pu le penser.

1. Introduction: Architecture as a Dependent and Independent Variable

Architectural determinism can be defined as the belief that architectural design affects human behaviour in some way - that is, that it acts as an independent variable in a describable process of cause and effect. One great difficulty in deciding if it is true or not lies in the fact that architecture is nearly always also a dependent variable: we design to reflect, as well as to create, a pattern of behaviour. Domestic space layout, for example, reflects cultural "codes", in which activity patterns, styles of decor and spatial layout all seem to be interrelated (Hanson & Hillier, 1982). But it would be a clear error to imagine that these interrelations were in any sense "caused" by spatial layout.

Even so, the arguments for architectural determinism are not easily evaded. Consider two kind of design "failure". If the design of a domestic space layout does not fit a culturally defined pattern of activity, this would not be thought of as a failure of architectural determinism, but as a failure to reflect a given cultural pattern in the design. But suppose an urban residential layout is designed with the intention of "creating life" - that is, of creating well used spaces that promote encounter and interaction among those who live there. If this fails to materialize, then we might be more tempted to think of it as a failure of "architectural determinism", since the architectural intention was clearly to create a novel outcome through design.

We might also, of course, be inclined to read it the other way, and blame the designer's misreading of the culture of the users. The failure to "create life" is, however, now so common that explanations through cultural variation have begun to appear unconvincing. In many parts of the world, new residential layouts, designed with the best of communitarian intentions, suffer from the blight of under-used, misused and abused space, so much so that a widespread belief now exists that this "spatial pathology" is at least in part the outcome of design, and that it is directly implicated in social pathology (see Coleman, 1985, and the surrounding controversy, including Hillier, 1986b). Paradoxically, it is the *failure* of "architectural determinism" to create communities through design that has made architectural determinism once again a live intellectual issue.

There are, however, two questions at issue, not one: does spatial design have consequences for the pattern of "spatial life" that takes place in it? And does spatial life have consequences for social pathology? The first question is clearly more architectural, the second more sociological. So far few, if any, genuine attempts have been made to answer the first, architectural question without invoking the second, sociological question. Yet, clearly, the whole issue of architectural determinism rests on the first question. If spatial design has no consequences for spatial life in the first place, then the question of the relation between spatial life and social pathology belongs only in the domain of the social sciences.

In this paper, an attempt is made to use space syntax to try to give a clear answer to the architectural question: does architectural design create a pattern of spatial life? Only at the end is a speculation raised as to the possible importance of the answer for social pathology or well-being. Our starting points are two. One is the belief that at the most elementary level, new environments have so often manifestly failed to "create life" in space. The second is the continuing belief amongst critics of contemporary environments (beginning with Jacobs, 1961, and continuing particularly through Newman, 1972 and Coleman, 1985) that environments *can* be successfully designed to "create life", and that where this occurs then the social effects are beneficial. Our question is: is this a true belief?

The paper is divided into two parts. In the first, simple statistical techniques will be used to explore a data base made up of the results of analysing a cross-cultural sample of the axial maps of 75 towns and urban areas using the "space syntax" method. The object will be to try to search for consistencies, variations and co-variations among a family of spatial parameters expressing different configurational properties of axial layouts. In this way, "space syntax" will be used to explore how urban spatial layout is constituted as a *dependent* variable, what configuration properties are built into the axial structures of urban spatial layouts, and how these vary and co-vary in different conditions.

In the second section, we will report a set of field studies of urban areas, in which observed patterns of movement are examined alongside space syntax analyses to try and establish how far systematic relations between the two can be found. In other words, in the second section we explore spatial layout as an *independent* variable, and look for its consequences in terms of observable patterns of spatial life.

The two sections are related by using the outcomes of the first section as guiding hypotheses for the second. It is argued that if certain properties are shown to be critical in urban spatial patterning as a dependent variable, then they may also be related to the ways in which spatial layout acts as an independent variable.

Taking the sections together, the study shows:

- that underlying the great morphological variety of real urban forms, there are certain consistent syntactic patterns and types of co-variation; in particular, two measures we call "integration" and "intelligibility" (see next section for definitions) are key properties of urban layouts;
- that the pattern of pedestrian movement in an urban area is determined in the first instance by the pattern of "integration", and the overall density of pedestrian movement by the overall degree of integration of the area. This means that densities of movement in urban spaces are determined in the main by the relation of spaces to the layout as a whole, and only secondarily by the local properties of the space, or location of facilities or "magnets";
- that there is a radical decline both in the densities of movement and in the predictability of the pattern of movement from spatial layout in many modern housing estates;
- that the reduction in overall densities is strongly associated with loss of integration, and the reduction in the predictability of the pattern of movement from the layout is strongly associated with the loss of "intelligibility".

In other words spatial layout does, in very precise senses, create - or eliminate - "life" in the sense that it determines a field of potential encounter and co-presence which can be made sparse or dense, and predictable or unpredictable, depending on the patterns of integration and the degree of intelligibility of the layout. These relations are systematic, and they are the product of architectural design. The paper ends with a sociological speculation on the possible importance of this result, and why it may be fundamental not only to the ways in which spatial layout relates to society, but also to society itself.

2. Spatial Layout as a Dependent Variable: the "Synoptic" Analysis of 75 Towns and Urban Areas

The towns and urban areas used in this study were for the most part analysed by post-graduate students at the UAS undertaking case studies. Axial analyses only were used in all cases. Using the number of axial line as the index of size, the systems varied from 13 axial lines (medieval Winchelsea) to 892 lines (Thessaloniki in 1926). The sample was drawn from many different countries to avoid cultural bias. Data produced by the analyses were fed into a synoptic data file comprising 86 variables for each case. Preliminary analysis showed that the "syntactic" variables were most effective in discovering systematic relationships. What follows is therefore set out in terms of the syntactic variables which proved most powerful.

As a result of this analysis, a model was evolved of what we now believe to be the fundamental measures of the axial representation of urban form. This model can be set out as follows. Viewed theoretically, an urban system is made up of two elements: a fixed system of spaces in a particular configuration; and a set of mobile "individuals" superimposed on that configuration. An urban system thus has both *static* and *dynamic* properties. This distinction is one dimension of our "model of measurement".

The other dimension is the distinction between "local" and "global" spatial properties. Each space constituting an urban system has certain relations to its neighbours. But it also has a certain position in the urban layout as a global whole. The relation between *local* and *global* properties is the second dimension of the model of measurement.

On the basis of these dimensions, a two level model of measurement can be suggested, in which "first order" measures are direct measures of the system of space, using the dimension of the model, and "second order" measures are relations among these measures.

The model of measures can be set out in a diagram:

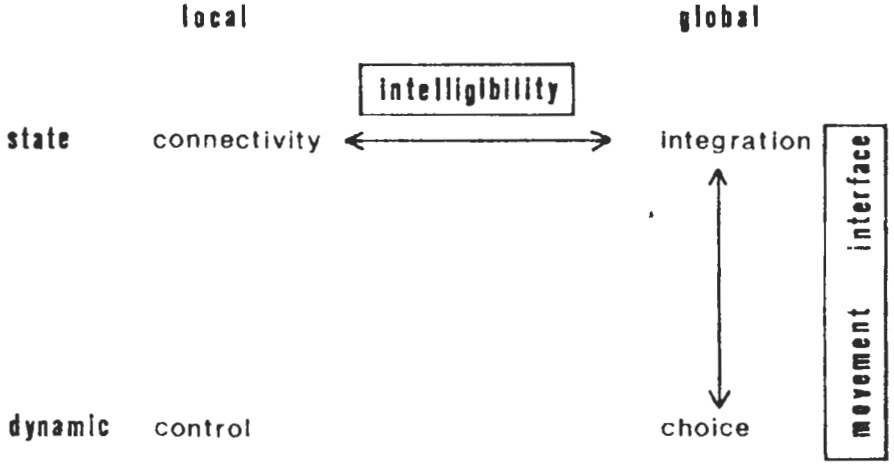

Fig. 1 Model of the fundamental measures of the axial representation of urban form. An urban system has both static and dynamic properties. This is one dimension of the model. The other is the relation between local and global properties. A two level model of measurement is suggested. First order measures are direct measures of the system of space, second order measures are relations among these measures.

Fig. 1 Modèle des mesures fondamentales de la représentation axiale des formes urbaines. Un système urbain a des propriétés tant statiques que dynamiques. C'est là une des dimensions du modèle. L'autre est la relation entre propriétés locales et globales. Un modèle de mesures à deux niveaux est proposé. Les mesures de premier ordre sont des mesures directes du système spatial, les mesures de deuxième ordre sont des relations entre ces mesures.

Of the first order of measures, the "local state" measure is simple connectivity: how many other lines are only one step away from each line (i.e. immediately connected to it). The "global state measure is " integration" (see "Syntactic Analysis of Settlements", above): essentially, how many other lines are up to *n* steps away form each line. The "local dynamic" measure is "control" (see "Syntactic Analysis of Settlements", above): what degree of choice does each space represent for its immediate neighbours as a space to move to. The "global dynamic" measure is "choice": the degree of choice each space represents (how likely it is to be passed through) on all shortest routes from all spaces to all other spaces in the system (Hillier, *et al.*, 1986a).

Second order measures are then relations among these measures, and take the form of Pearson product moment correlation coefficients (r). The most important of these is the correlation between connectivity and integration. This is called "intelligibility", because it indexes the degree to which the number of immediate connections a line has - which can therefore be seen from that line - are a reliable guide to the importance of that line in the system as a whole. If locally well-connected lines are also integrating lines, then the correlation will be strong and the system will have "intelligibility". The whole can be read from the parts. Conversely, if well connected lines are not also integrating lines, then the correlation will be poor, and the whole will not be readable from the parts.

Equally suggestive is the degree of correlation between the "global state" measure (integration) and "global dynamic" measure (choice). The correlation between these two variables will indicate the degree to which the accessibility of a space as a destination from all others (how many steps it is away from all other spaces in the layout) is a reliable guide to its likely popularity as a space to be passed through on shortest routes from all points to all other points in the layout. More simply, it indexes the degree of agreement between a space's potential for *to-movement* and *through-movement*.

A word of warning must be inserted here. Extensive research has shown that in most urban layouts the best predictor of movement is integration, not choice. Our present conjecture is that it is because the degree to which a space is likely to lie on the shortest routes from all points to all other points in the layout is not an intuitable property of the layout, whereas the number of steps a space is from all other spaces is an intuitable property in that knowledge of it can be built up over time by moving around the layout.

Choice may however be a better predictor of movement for "inhabitants" with better knowledge of the layout than for "strangers" who rely on reading the layout, in order to move around. The dominance of integration as a predictor may be because there are always a good number of relative strangers in an urban layout. If this is the case then the correlation between integration and choice might index the degree of correlation between two types of movement pattern: that of relative strangers with less than a full knowledge of the layout; and that of inhabitants, with much better knowledge of the layout; or more simply, the degree of "movement interface" between inhabitants and strangers.

It was the statistical analysis of the spatial data of the 75 towns that first suggested that these two variables were critical to the structure and functioning of urban layouts. This analysis followed a procedure in which the means and distribution of first and second order measures for the 75 towns were first analysed and correlated with the size of the system as indexed by the number of axial lines, *k*. Correlations between first and second order measures were then examined, controlling for size, and

controlling each first order measures for others, to see how far second order properties were dependent on first order properties. Finally, correlations between second order measures were examined, again controlling for size and first order measures.

Working from the simplest to the most complex properties of urban layouts, the analysis showed that:

- the mean connectivity of axial lines in urban layouts is 3.6, but this does not increase with the size of the system; what does increase is the maximum connectivity. Urban systems grow by priviledging only a few lines, which form a kind of "supergrid".
- the mean integration of urban layouts of all kinds is .93, and this is not influenced by size; layouts can be more or less integrating regardless of scale; this confirms a property often noticed in individual town studies, that as towns grow they maintain their overall degree of integration more or less constant;
- the mean correlation of connectivity and integration ("intelligibility") of urban layouts is r = .68, and this tends to decrease as the system grows;
- the mean correlation of integration and choice (hypothetically, the "movement interface" of inhabitants and strangers) is r = .74, and again this is strongly affected by the size of the system;
- the strongest first order determinant of second order intelligibility is integration (r = .71, controlling for size);
- there is no strong first order determinant of "movement interface", but there is a strong order determinant: "intelligibility" (r = .79; r = .85 controlling for integration, falling to .54 controlling for size).

In other words, integration (the first order global state measure) leads to intelligibility (the second order measure of the degree to which global properties can be inferred from local properties), and intelligibility leads to a stronger "movement interface" between inhabitants and strangers.

In order to test how far these suggestive properties were real properties of urban systems, rather than mathematical artifacts, a doctoral student at the UAS, Fatiha Salah-Salah (Salah-Salah, 1987) carried out the same analysis on a sample of 70 computer generated quasi-urban systems, having most of the properties of urban layouts but lacking any "global" rules governing their growth, i.e. they were generated only by local rules governing how spatial and building elements related to their neighbours. The results showed that the properties and relations emerging from the study of the 75 real layouts in all cases either were not found, or existed only very weakly in the simulated cases. This confirms that the "synoptic" study of the 75 real layouts was identifying properties that were distinctive to urban layouts, which would not arise naturally in a cell-growth process which lacked "urban" constraints. The properties revealed were therefore used as a source of hypotheses for testing in the field studies of space use and movement in real cases.

3. Field Studies of Urban Space Use and Movement Patterns

The strategy of the field studies programme was to select a range of different types of urban area, systematically observe the rates to which their constituent spaces (as defined by the axial map) were used for movement, then statistically correlate the different spatial parameters for spaces to the movement rates to see how far systematic relations could be found. Areas were selected to be as different as possible within

Fig. 2 Plan of the area of Barnsbury in inner North London.
Fig. 2 Plan du quartier de Barnsbury au nord de Londres.

Greater London, and included inner urban areas organized in street systems, suburban areas, and modern housing estates of various kinds and periods. In each case, the observation area was embedded in the surrounding urban system at various scales, to see which level of definition of the spatial system gave the best prediction of movement in the observed spaces.

The observation method was to select routes in each area to include a range of integrating and segregating spaces, then use observers moving at about 3.5 m.p.h. (5.6 km.p.h.) to record all people who were passed on the route. People were recorded as being either moving or static, and were only recorded if moving on the same axial line as the observer, i.e. those crossing at right angles on other lines were not counted. The results of these observations were given in "encounter rates", i.e. persons observed per 100 metres/minute, since at 3.5 m.p.h. it takes about one minute to walk 100 metres. Encounter rates for the observed spaces were then plotted against the various spatial parameters for those spaces.

4. Urban Areas

Figure 2 is the plan of the first observed area, Barnsbury in inner north London, and Figure 3 is its axial map with most integrating spaces marked in heavy black lines (and numbered in order of integration) and most segregating in dotted line. The results of the observation study were plotted against the four first order spatial parameters (integration, connectivity, control value, choice) to determine Pearson correlation coefficients for each. All the spatial variables correlate well with the encounter rates (respectively .8004, .6434, .7197, .7345, and all are better than simple metric variables, such as length of axial line), but *integration* is markedly the best, with a correlation of r = .8004 and a good distribution across values on both axes (Fig. 4).

Correlations have also been calculated for integration against encounter rates for four other urban areas in London (St. Peter's Street area; City of London; Highgate; Islington), all of which have integration cores which "cover" the system, in that they link the heart of the system to the periphery in several directions. In all cases, integration gives a better prediction than any other spatial parameter (to an average of .75) and in each case it improves when the reciprocal of integration is plotted against the square root of the moving encounter rate (Fig. 5, scattergram for Islington).

These results may be explored a little further to discover a key aspect of London's urban structure. When the observed area of Bansbury is embedded in a larger and larger area, thus leaving the encounter rates for spaces constant, but reading integration values for a larger system, the correlation deteriorates markedly (Fig. 6). In fact, if one extends the reference system to the level of the concatenated study (see below), the most integrating line in the smaller named area - the "village line", on which shops, a garage and a pub are found - becomes only the twelfth most integrating of the area in the larger system. The system actually looks different in terms of its pattern of integration as the reference system is expanded.

On the other hand, when taking the larger St. Peter's Street area in the contrary direction, and embedding the observation area in smaller systems, it becomes evident that the more the reference area is reduced below the size of the area defined, the worse the correlation. The correlation also deteriorates when the internal structure of the two housing estates within the area are added, showing that they too distort the picture of the area needed to give the best prediction of the pattern of movement.

Figure 3

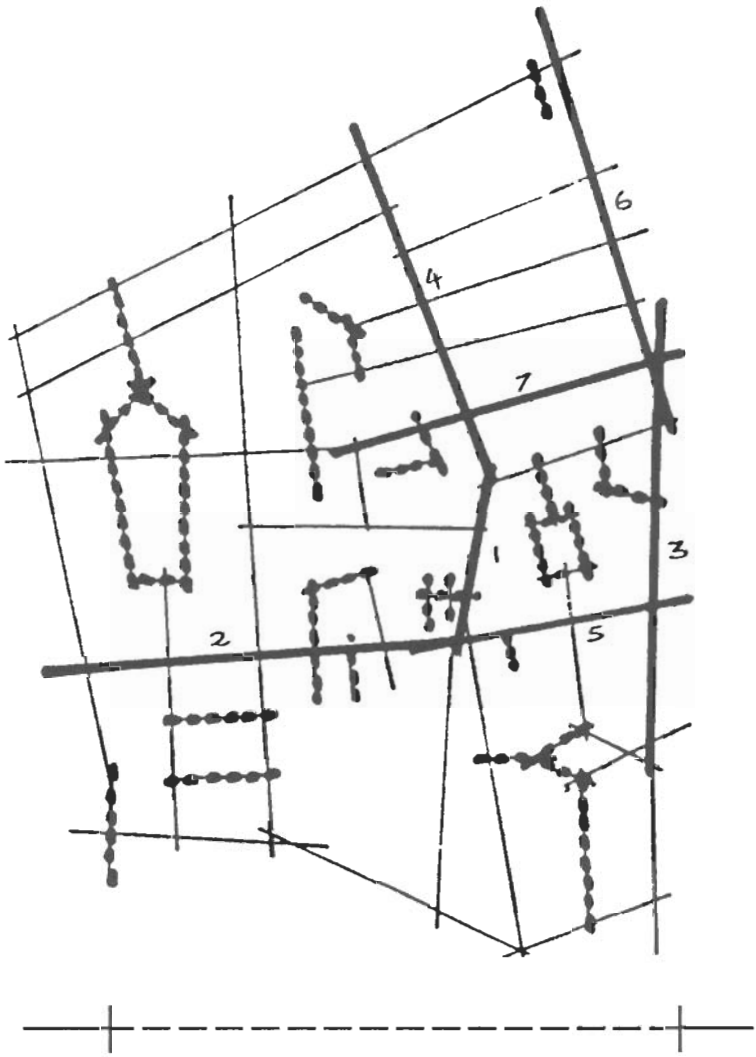

Fig. 3 Axial map of Barnsbury showing 10% most integrating spaces (heavy black lines numbered in order of rank) and 50% most segregating spaces.

Fig. 3 Carte axiale de Barnsbury, montrant les 10% d'espaces qui sont les plus "intégrés" (lignes noires épaisses numérotées par rang) et les 50% d'espaces qui sont les plus séparés.

Figures 4 and 5

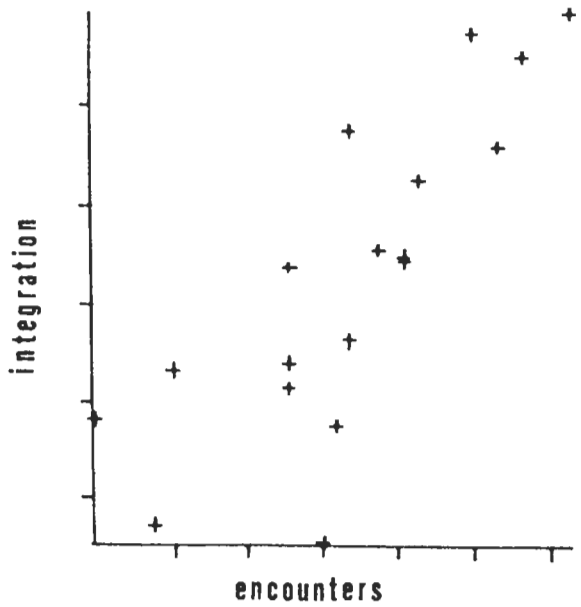

Fig. 4 Scattergram showing the correlation of encounters (number of people recorded per 100 metres/minute moving on the same axial line as the observer) with the spatial parameter of integration in Barnsbury, on routes including a range of spaces (r = .8004).

Fig. 4 Diagramme de dispersion montrant la corrélation entre rencontres (le nombre de gens par 100 mètres/minute se déplaçant sur la même ligne axiale que l'observateur) et le périmètre spatial de l'intégration à Barnsbury, dans des rues incluant une variété d'espaces (r = .8004).

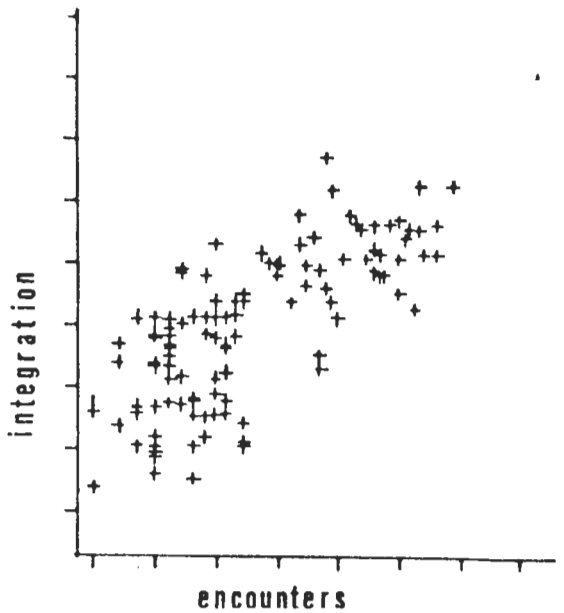

Fig. 5 Scattergram showing the correlation of encounters with integration in the concatenated area of Islington (r = .7323).

Fig. 5 Diagramme de dispersion montrant la corrélation entre rencontres et intégration dans l'aire élargie de Islington (r = .7323).

AREA	SIZE	INTEG-RATION	ENCOUNT. RATE	REAL PREDICT.
BARNSBURY	k	*RRA mean*	*ENC Rate mov/100 m*	*1/RA. ENC*
BARNSBURY 1	61	0.7137	2.67	.8004
BARNSBURY 2	217	0.7334	2.67	.7104
BARNSBURY 3	833	0.7760	2.67	.6541

Fig. 6 When the observed area of Barnsbury is embedded in a larger area (1-2-3), thus leaving the encounter rates for spaces constant, but reading integration values from a larger system, the correlation deteriorates markedly.

Fig. 6 Lorsque l'aire observée de Barnsbury est inclue dans une aire plus vaste (1-2-3), en laissant les données des rencontres constantes pour les espaces en question, mais en retenant les valeurs d'intégration des aires plus vastes, la corrélation est nettement plus faible.

Those results suggest that the technique of optimizing the reference area to give spatial parameters which best predict the pattern of movement may permit the identification of something like natural areas and sub-areas in a continuous fabric. These are nothing like "neighbourhood units", of course, since they are part of a continuous and well integrated urban structure. But they do appear to have the merit of setting a morphological limit to the size of area that needs to be taken account of in inserting a new development in an urban area.

5. Suburban areas

The suburban areas studied produced more differentiated results. Let us consider three very different observation areas. In the first case, Bedford Park, the integration core is entirely on the outside of the area, but a strong correlation is still found, since the encounter rate falls rapidly as the area is penetrated from the peripheral core. Similar correlations can be achieved by counting axial depth from the peripheral core as the spatial parameter, or simulation movement to and from the core.

In the second case, Golders Green (Fig. 7 & 8), where the layout is dominated by two long shopping streets, strong correlations with integration are also found (Fig. 9), though again equally good results are achieved by simulating movement to and from the main streets. In the third case, Bexleyheath, a much larger scale and more sprawling area of South London, the correlation with integration is much weaker, and a good prediction can only be achieved by simulating movement to and from the dominant main shopping street. In contrast to urban areas, therefore, where the movement pattern is structured by an integration pattern whose core covers the areas and links the heart of the area to the periphery, suburban areas, which lack such core structures, have their movement patterns dominated more by the attraction of key spaces within the system.

Figure 7

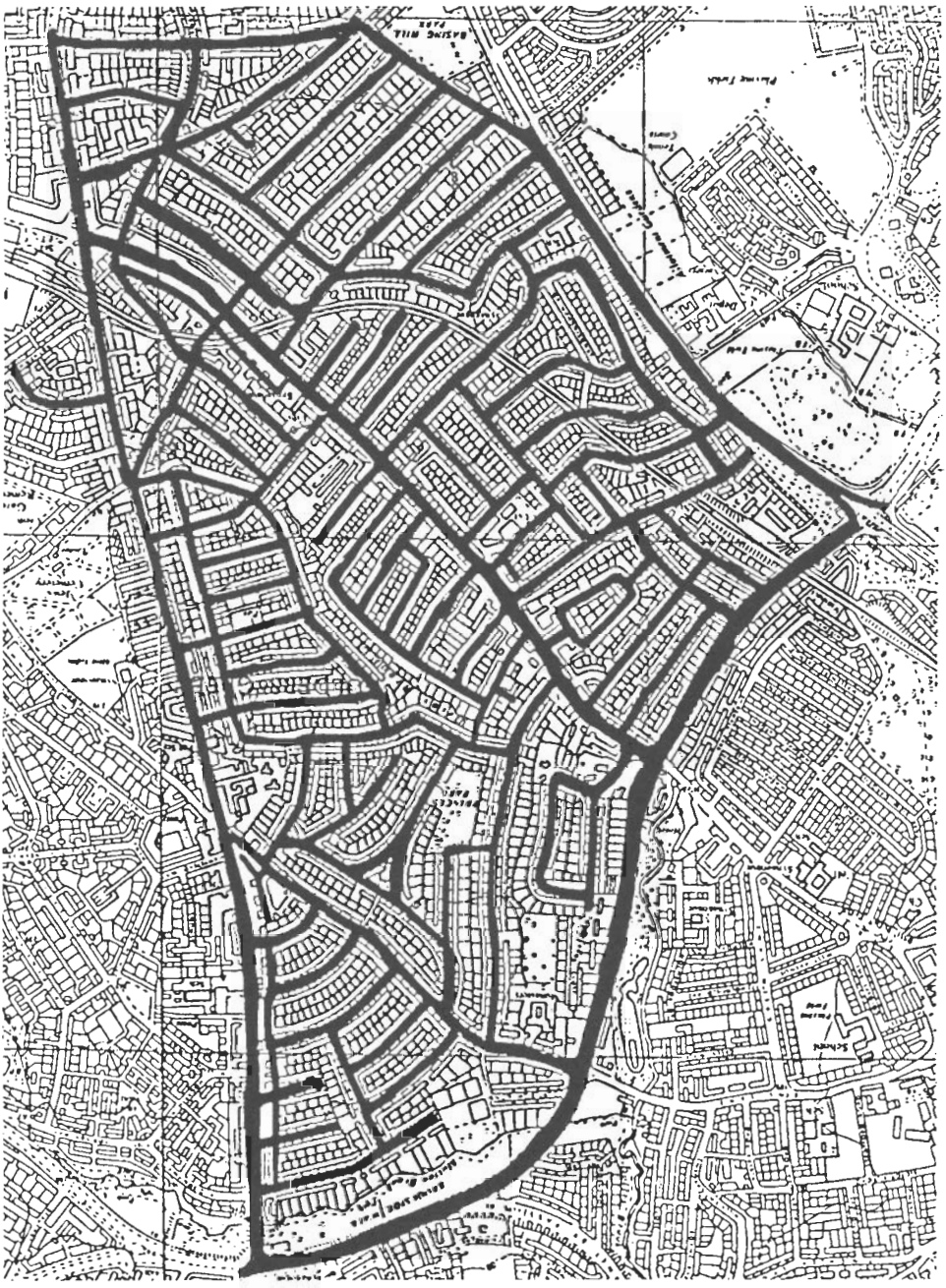

Fig. 7 Plan of the Golders Green area in North London.
Fig. 7 Plan de Golders Green au nord de Londres.

Figure 8

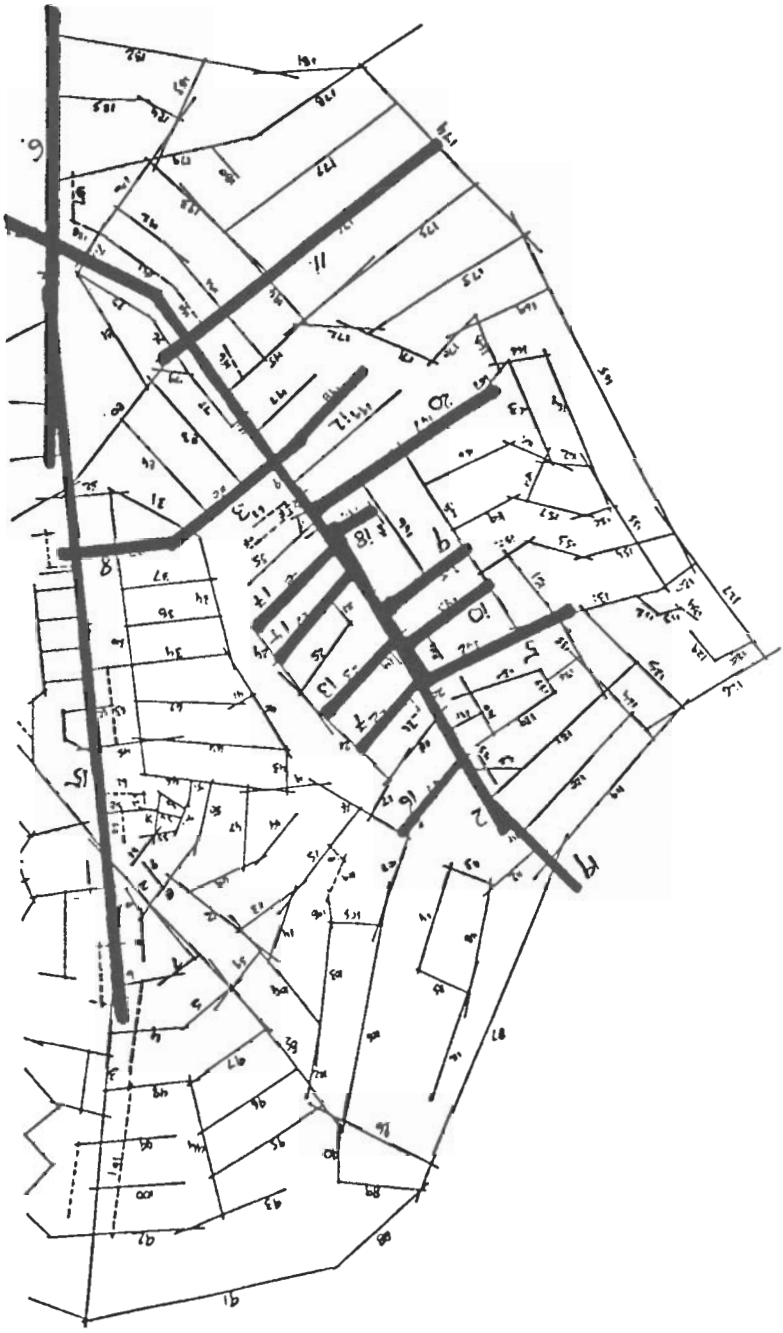

Fig. 8 Axial map of Golders Green showing the most integrating spaces (heavy black lines).

Fig. 8 Carte axiale de Golders Green montrant les espaces les plus intégrés (lignes noires épaisses).

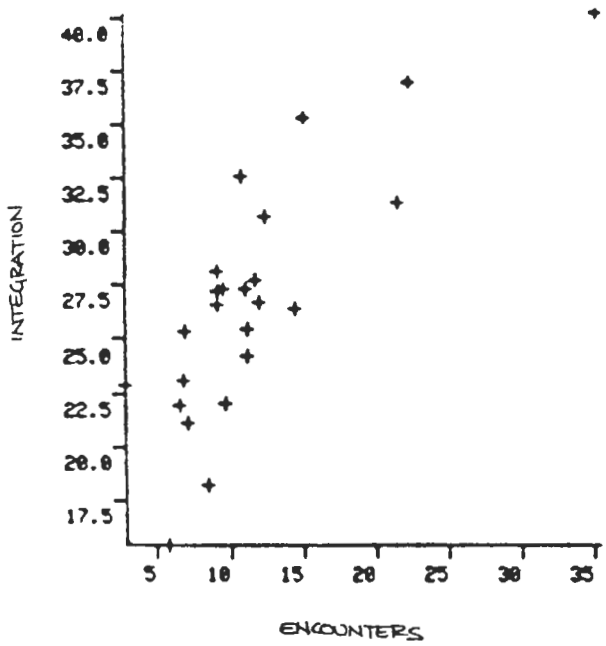

Fig. 9 Scattergram showing the correlation of encounters with integration for larger systems (199 spaces, in Golders Green), r = .8029

Fig. 9 Diagramme de dispersion montrant la corrélation entre rencontres et intégration pour des aires plus vastes (199 espaces, à Golders Green), r = .8029

6. Housing Estates

Housing estates again tell a different story. Many different estate types have been studied, varying from the large scale streets-in-the-air structures, to small scale neo-vernacular schemes. In spite of these differences in scale and style, in nearly all cases, the internal structure of the estate is of such complexity that the integration core lies entirely on the outside of the estate. An example of this type is the Marquess Road estate in Islington, North London. In this case, the encounter pattern becomes unpredictable in terms of the internal layout. However, when the estate is embedded in the whole of the Islington area, and the integration values are read from a much larger system, then a better prediction is found. This reflects two things: first, the fact that the greater depth from the outside of the estate means greater segregation from the area as a whole; second, that the movement to and from the outside that results is biased in favour of different external spaces according to their importance in the larger system. In general, most housing estates follow this pattern of a peripheral core coupled to an encounter pattern which falls off rapidly as one moves deeper into the estate.

Where the layout is not of this type - as for example in the upper level of the Camden housing estate in Peckham, South London - then the covering core links to dwelling entrances and creates a pattern of movement at something like a normal urban

level, strongly related to the integration pattern. However, at the ground floor of the same estate, which is organized in a series of relatively secluded enclosures interspersed with garage access, we find an overall encounter rate only one third of that at the upper level, with no relation to the integration pattern.

Such cases are, however, exceptional. In most housing estates, where the integration core lies on the periphery, two effects occur in parallel. First the overall encounter rate falls to something like a third or a quarter of the norm for urban residential streets (.6 to .8/100 m/minute as opposed to 2.6/100 m/minute). Second, the encounter rate of spaces becomes more a function of depth from the outside than the internal pattern of integration. In other words, the encounter structure makes sense only in terms of the relations of spaces to the outside: as you enter the labyrinth, people disappear.

Paradoxically, then, housing estates which are designed as identifiable spatial entities are in fact subordinated to their surroundings. They have no internal structure of their own. Urban areas, in contrast, while being designed to be part of a continuous fabric, do have an internal identity. It is this that creates the relation between spatial pattern and movement pattern which seems so fundamental to well-ordered urban space.

The reduction in encounter densities on estates is so dramatic on some estates (like Marquess Road) that we find that in the middle of the day their encounter rates are comparable to those found in quiet residential street areas, like Barnsbury, in the middle of the night. From the encounter point of view, one might say that the inhabitants of these estates live in perpetual night.

7. Hypothesis Testing Studies

Throughout these studies, there are suggestive relations between encounter rates at the area level, integration values, intelligibility and the degree to which movement is predictable from integration. The trouble is that hypotheses cannot really be tested because the data is too heterogeneous, and based on different systems of spatial reference.

In order to explore these possibilities further, two "synoptic studies" using real encounter data were carried out. One was a synoptic study of a very large area of London (concatenated area) within which 6 independent studies were carried out. The idea was to analyse all these studies on the basis of the same very large spatial system and explore the relations between the "model" variables at the synoptic level. The second study was carried out by a doctoral student at the UAS, Xu Jianming, and involved the study of seven estates comparable in size and density, though with fundamentally different morphologies, varying from early post war modern, through streets-in-the-air to recent neo-vernacular.

The results for the two groups of studies in North London show the degree of correlation between mean integration and overall encounter rate (respectively .947 and .875) to be remarkable. The relation between the intelligibility of each study area and the degree to which the encounter pattern is predictable from integration shows again similarly strong correlations in both sets of data (.940 and .870, respectively).

These suggestive results indicate that, as we might expect from the analysis of urban space as a dependent variable in the 75 towns study, the degree of integration influences the overall encounter rate of urban areas, and the degree to which encounter is predictable from the spatial pattern is a function of the intelligibility of the layout.

Taking the findings as a whole, it is clear that there are systematic and measurable consequences from layout decisions: an encounter field is generated with well de-

fined properties of distribution, density, and predictability, depending on the properties of the layout and the relation to the surrounding area.

The question is: does it matter? Does anything of sociological relevance follow from this? In the final section of this paper, we will suggest that it does matter - but that to recognise it we need to introduce at least one new spatial concept into sociology.

8. The Virtual Community: a Sociological Conjecture

It is often said that cities are mechanisms for generating social contact. Looking at what has been done to cities in the past quarter century, one may doubt the generality of this principle. The city in its modern transformation sometimes seems more like a mechanism for keeping people apart in conditions of high density (Hillier & Hanson, 1984). The under-use, non-use and abuse of space - the "urban desert effect" - are the distinctive products of the modern transformation of the city.

Even so, the notion that cities are, in some fundamental sense, mechanisms for generating contact is amply supported by this research. But it offers more than a repetition of an otiose generalization. Some useful precision can be brought into the proposition. One may suggest, at least:

- that cities are not so much mechanisms for generating contact as mechanisms for generating a *potential field of probabilistic co-presence and encounter*. What happens beyond that is not the direct effect of the city, but an effect of culture. The prevailing culture may however itself be an indirect, evolutionary product of the city. But without this cultural dimension, it would not be possible to use spatial design to achieve a sociological or cultural result. All that may be created is the field of potential encounter - the life - that might lead in the direction of a sociological or cultural result;
- that the field of probabilistic co-presence and encounter generated by an urban layout has a definite and describable structure, one which varies greatly with the structuring of space; it can be sparse or dense, localised or globalised, predictable from the intelligible structure of space or unpredictable, and mix inhabitants and strangers in different degrees.

In other words, the pattern of co-presence has both a describable pattern and a known cause. Such a well-defined entity deserves a name. We suggest it should be called the *virtual community*: community, because it *is* a form of group awareness in a collectivity; virtual because it has not yet been realized through interaction among its members. The virtual community is the product of spatial design. It may be its only product. The question is: is it a sociologically important product?

We suggest that it is, by the following reasoning. People rarely identify themselves as belonging to a single community, but to several different kinds of community: to do with work, interests, locality, and so on. Typically, different types of "community", so defined, will have different types of rules for membership, different degrees of exclusivity or openness, and require different behaviours from their members. Community, we might say, has many transformations.

There may, however, be limits to the possible diversity of community. Some transformations seem very basic, and recur in most societies. For example, some types of "community" define themselves as being made up of members who are in some important sense different from other people. Guilds would be an example. Guilds typically have strong rules governing entry, specific ceremonials to express the differences between this group of persons and others, and well-developed internal hier-

archies. Of course, guild members also belong to other types of community. That is not the point. The point is that this particular transformation is about group difference, and because it is, strong admission rules, exclusive ceremonials and hierarchies become a kind of structural necessity.

In contrast to this, we might follow Turner (Turner, 1957) in seeing religious congregations as essentially undifferentiated, expressing a transformation of community in which social differentiations are suspended, and "anti-structure" takes over from social structure. Such transformations of community are typically open, share ceremonial forms with other congregations, and impose, under the priest, a liturgical equality on all members. This is the transformation of community that Turner terms "communitas".

In contrast again, we might note the Durkheimian concept of an "organic solidarity" (Durkheim, 1964) in which the interdependence and interactivity brought about by a division of labour imposes a collective identity on a group. Here again, the situation is marked by differentiation, but of individuals rather than groups, and the openness we associate with the streets of the city as a theatre of exchange and trade, rather than closure.

It is clear that such different transformations of community take on differing spatial forms and have different spatial rules. A guild building is typically a closed, segregated, inward looking building, in which the ceremonial spaces are remote from the public space of streets. Churches, in contrast, define a much more public presence, and their ceremonial centres are usually linked to the public domain by axes which permit at least a visual relation between the objects of ceremony and the public domain. The form of space relates directly to the transformation of community and its characteristic rules.

We suggest that the "virtual community" is one such transformation of community, one way available to us of defining ourselves as social members. Etiologically, it is the product of spatial arrangement, and structurally it takes on the form prescribed by the spatial arrangement: more or less open or closed, more or less localised or globalised, more or less dense in inhabitants and strangers. It is essentially both open and undifferentiated. People are members by virtue of spatial presence. Like Turner's "communitas" it constructs a space of anti-structure rather than structure. In the streets, people have an equality that they may not possess in the closed domains which express social differentiations.

It may even be suggested that the "virtual community" is both the most rudimentary of all forms of common awareness, *because* it is produced only by spatial arrangement, and also the most fundamental, because it is the profane, open counterpart of the undifferentiated community of Turner's "communitas". As such, it may be a far more important social and psychological resource than has been allowed.

Certainly, it is the form, density and structure of the virtual community that has been so decisively changed by the urban interventions of the recent past. Is it possible that through these spatial transformations we have removed a key social resource, and removed it exactly from those sections of our society who could least do without it?

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