Forum

The city’s essential DNA: Formal design and spatial processes in the urban patterns

Mark David Major
Founder, The Outlaw Urbanist

Pages: 160-165
Our descriptions of cities are often based on their physical form. In urban theory, these descriptions are usually expressed in terms of a dichotomy whereby meaning emerges from contrasting cities as organic or regular, unplanned or planned, natural or artificial, generated or imposed, and so on (Gallion and Eisner, 1963; Alexander, 1965; Moholy-Nagy, 1968; Batty and Longley, 1984). Kostoff (1991) suggests this dichotomy is ‘the most persistent, and crudest, analysis of urban form’. Hillier et al. (2012) even argue that ‘we should abandon the long-standing distinction between geometric and organic cities’ because it does not adequately address the deliberate use of geometry at different scales of the city (p.187). Notably, the first stresses process over time in terms of ‘unplanned evolution’ or ‘instinctive growth’, whereas the second stresses the conscious act of design in a ‘centrally planned scheme’ (Kostoff, 1991, p.43). This ‘shorthand’ provides a basic understanding of cities across different times, cultures, and geographical regions. The usefulness of descriptions such as ‘organic’ or ‘regular’ lies precisely in the fact they are theory-loaded terms. They seemingly convey a lot of information in an easy-to-grasp manner. We say ‘seemingly’ because these terms are so theory-loaded they can often lead to confusion, which can make their descriptive value ‘more a hindrance than an aid’ (Kostoff, 1991, p.43). For example, ‘regular’ seems to be an explicit description of both the physical form and design process that gave rise to that composition. However, the term ‘organic’ seems to only pertain to process. According to Battley and Longley (1994), organic cities ‘grow naturally from a myriad of individual decisions at a much smaller scale than those which lead to planned growth. Planned cities or their parts are usually more monumental, more focused, and more regular’ (p.8). The term ‘deformed’ is sometimes used to describe the physical form of organic cities, but more often than not, is tacitly understood to be a given about such cities. This explicit and implicit description of urban form and process forms the basis of their descriptive value, since most cities are easily classified as having common or different attributes when characterised as organic or regular.

There have been frequent attempts to develop a more precise terminology, usually in better uniting or divorcing form and process as aspects of the description (Harris and Ullman, 1945; Moholy-Nagy, 1968; Kostoff, 1991). Such attempts tend to only lead to a plenitude of jargon that confuses as much as it clarifies in urban theory (Marshall, 2005). However, describing the physical form of cities as ‘deformed’ or ‘regular’ is also theory-loaded because it implicitly characterises them in geometrical terms. The key is the incidence or deficiency of a readily apparent geometric logic to the physical arrangement of streets and block in plan, i.e. the composition. For example, the composition of Greek, Roman and American settlements tends to possess such geometries so they are regular grids. On the surface, the layout of European or Middle Eastern ‘organic’ settlements appears to lack such geometries so they are deformed grids (Karimi, 1997, 1998; Hillier, 1999, 2009). In Streets and Patterns, Marshall (2005) defines this anomaly as the difference between composition and configuration so to better distinguish between how we view the city and how it actually works. Implicit in his distinction is the difference between a static and dynamic view of urban space whereby composition is an easy-to-grasp, understand-all-at-once type of descriptive shorthand, and configuration is the more complex description of relations between elements with the potential to affect the functioning of
the urban environment. In applying this distinction, Marshall *(ibid.)* explicitly seeks to separate form and process so that our descriptions can provide a better understanding of the relation, if any, between these two essential components of the urban object. The goal is to avoid the theoretical dead-ends we are inevitably led to when the differences between composition and configuration in the urban pattern of cities are confused and misunderstood.

At the opposite end of the scale at the level of the street itself, Duany and Talen’s (2002) model of *The Urban Transect* specifies form and process in the design of the street for those transitioning from the Euclidean zoning model to form-based codes (principally, planners and elected officials in the United States). In transect planning, an explicit multitude of formal variables (street widths, road sections, building footprints, landscaping) is implicitly related to the functional use of the city (density and intensity). According to Hillier (1996), the urban pattern exploits ‘movement constructively to create dense, but variable, encounter zones’ as ‘mechanisms for generating contact’ (p.130). It appears that what varies from one type of layout to another is the geometry and scale in which it occurs: ‘a continuum in which geometry is applied to the growing city somewhere between the whole city and the line’, in what Peponis describes as designing cities as ‘interfaces between scales of movement’ (Hillier et al., 2012, p.187; Peponis quoted in Hillier, 1996, p.131). In transect planning, Duany and Talen appear to have created an idealised model of this essential urban dynamic at the most local level of the street in an effort to better classify it for application in form-based zoning regulations and streetscape design. Duany and Talen’s explanatory diagram of transect planning specifies a geometric logic (all urban streets connect at right angles) but the applicability of transect planning for all types of cities seems readily apparent. What varies from one city to another is geometry and scale as realised in the layout. The true brilliance of transect planning is that the more it is applied in real world conditions, the less tenable the roadway classifications of modern transportation planning become, especially in the United States (Major, 2013). However, transect

---

**Figure 1:**

*The Urban Transect.*
planning is largely silent about generating an urban pattern above the level of the street, leaving this to the design sensibilities of the professionals. This appears to leave a gulf of understanding between the urban whole and the street itself. However, this is precisely where the essential dynamics of form and process as affecting urban functions are realised in cities.

Marshall’s (2005) pursuit of theoretical clarity and Duany and Talen’s (2002) pursuit of formal clarity in our descriptions of the urban pattern are admirable and understandable. However, form and process will eventually have to be brought back together into a common frame if we can ever hope to effectively intervene in the city. The answer lies in the functional implications of formal geometries in the urban pattern, which Hiller (1999; 2009) defines as configurational inequalities. Hillier (1999) has pointed out that the deformed grid layouts of organic cities actually possess a consistent geometric logic underlying their superficial, apparent disorder. The geometry characterising deformed grids is near right angle connections usually within 15 degrees of a right angle, and very obtuse angles usually within 15 degrees of a direction continuation, with angles near to 45 degrees occurring less frequently. The result is that principal streets tend to be composed of successive lines of sight that terminate on building facades at an open angle (i.e. greater than 90 degrees) and serve to indicate continuation of that street; whereas secondary streets tend to connect to principal streets at or near right angles. This geometry tends to emerge in deformed grid layouts from a local process of aggregation in a settlement; that is, the aggregating of dwelling units based on simple, purely local rules (Hillier and Hanson, 1984). During the evolution of urban form in deformed grid layouts, streets also tend to become straighter and wider, and blocks become larger in size to varying degrees - more so in European settlements (Hanson, 1989) and less so in Middle Eastern ones (Karimi, 1997;1998). However, the more far-reaching effects of urban space having the characteristics of one configurational inequality or another, in terms of its formal geometry, may lie in giving shape to the material world in which we live, work, and play. Hiller and Hanson (1984) argue in *The Social Logic of Space* that the physical arrangement of space ‘has a direct relation – rather than a merely symbolic one - to social life, since it provides the material preconditions for patterns of movement, encounter and avoidance which are the material realisation – sometimes the generator – of social relations’ (ix). New Urbanism has been arguing likewise for 30 years. In everyday practice, this can become complicated due to the tendency to view and design space in discrete terms, independent of its larger geographical, topographical, and/or urban context. In doing so, the importance of design in establishing the material preconditions for our everyday use of urban space is often minimised, misunderstood, or even ignored.

Our design decisions in generating the urban pattern are important. For example, it is within this realm that a significant (and little discussed) distinction arises between intra-connectivity (street connections within the bounds of a site) and inter-connectivity (street connections between bounds of different sites). Historically, intra-connectivity has been strongly realised in New Urbanism developments, but inter-connectivity much less so. Rather than simply leaving design of the urban pattern to the (varied) abilities of professionals, we must identify and understand it to enable better, smarter intervention. If we focus on the static and dynamic relationships between form and process, and composition and configuration, in the design of the urban grid, a basic set of design decisions with formal and process implications for urban space can be identified.

We could describe this as the essential DNA for all types of cities. What varies from one urban model to the other is the scale of their geometrical
implementation. Take for example, *grid expansion* and *deformation*, whereby the existing urban pattern is expanded in a consistent manner with that already present, or else deforms in relation to some external factor, most often topography or land ownership patterns. Historically in American cities, deformation usually occurred for these reasons, while still adhering to the basic conceptual order of the existing urban pattern but along a different alignment with reference to cardinal directions. In deformed grid cities, deformation usually takes place during the process of up-scaling city form with the introduction of a more readily apparent geometry, usually in relation to the alignment of principal roads. For example, the Paddington area of Central London in relation to Edgar Road and Bayswater Road, compared to the pre-20th century small scale of urban blocks in the older City of London to the east. Then there is *street extension*, whereby an existing street is extended in one or both directions. In American cities this tends to occur as a straight-on extension in adherence with the conceptual order of the regular grid; whereas in deformed grid cities, this occurs as an open-angled continuation as described by Hillier (1999). Street extension is also the primary tool for strip development in the growth of linear and crossroad settlements, especially during the early stages of community growth, of which Las Vegas is probably the most famous example.

The most easily recognisable form of the urban dynamic, described by Rossi (1982) as the dynamics of ‘destruction and demolition, expropriation and rapid changes’ (p.22), is *block size manipulation*. We regularly see this in the upsizing and subdivision of block sizes in cities over time. The dynamic nature of block size manipulation in our cities can be easily seen in a side-by-side figure-ground representation (blocks in white, space in black) of Philadelphia yesterday and today. There are two remarkable yet seemingly contradictory things about
this comparison. First, is the degree to which the original block scheme of Penn’s plan has changed, principally through a process of block subdivision; second, is the degree to which the integrity of Penn’s original plan concept has endured despite hundreds, perhaps thousands of small and large-scale interventions over 330 years.

Finally, there is discrete separation by linear segregation of streets found in all types of cities. Street connections are either broken or complicated in order to segregate a particular (usually residential) portion of the urban grid. Historically, the most extreme examples of discrete separation by linear segregation are found in Middle Eastern and American urban grids (Karimi 1997, 1998; Major, 2013). In the deformed grids of Middle Eastern cities, this principally occurs through the narrowing of street widths so that lines of sight are convoluted into an urban pattern that is often described as labyrinthine-like, but actually has a well-defined spatial logic (Karimi, 1997). In the regular grids of American cities, with their emphasis on expansive street widths and block sizes, this spatial isolation can only be accomplished through interruptus in extremis. Of course, the most apparent and perverse examples are found in 20th century American suburban sprawl models of development. In this case, intra- and inter- connectivity (connections within and connections outward) are restricted to the bare minimum so that residential areas are close to main roads in Cartesian terms, but effectively isolated in configurational terms from the surrounding urban context in the form of segregated enclaves.

These design methods are present in the urban pattern of all cities. The spatial processes associated with formal design tend to converge, as Hillier argues (1996), on the ortho-radial grid model in all cities of the world. This is a prime example of what Carvalho and Penn (2004) mean by saying ‘the impact of local controls on growth... is, at most, spatially localized... at a macro level, cities display a surprising degree of universality’ (p.5). In fact, the essential variation across different types of cities appears to be the scale of street lengths and connections tied to their degree of geometrical articulation: longer, more connected and expansive in regular cities primarily using right angles; shorter, less connected and more compact in organic cities using open and right angles. Ultimately, cities are not so complicated; rather, it is our theories that tend to complicate our understanding of them.

Notes:
1 Presumably, this refers to local controls in the sense of zoning and development regulations for particular sites. The implementation of growth management policies such as greenbelts associated with park systems in Greater London or Baltimore, or urban growth boundaries in cities such as Portland, do have a demonstrable spatial effect at a larger scale (Pierce, 1998).
J O S S

Forum:
The city’s essential DNA

Major, M. D.

About the author:

Mark David Major, AICP (mark@outlaw-urbanist.com) is a former member of the Unit for Architectural Studies at University College London and former Director of Space Syntax Ltd. He is the founder of International Space Syntax Symposia, now in its 16th year of existence. He is a certified planner and member of the American Institute of Certified Planners (AICP) and American Planning Association (APA) since 2003. He is currently the Business Director of Starr Sanford Design and founder of the architecture, urban design and planning blog, The Outlaw Urbanist. Mark is the author of Poor Richard, An Almanac for Architects and Planners.

References