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Morphogenesis of urban space:

a research study

Antonio Cappuccitti, Elio Piroddi*

Our research project consisted in the diachronic analysis of urban morphology on two levels: the first regards morphologically homogeneous portions of the city recognizable on the urban scale, and the second concerns structuring urban spaces and forms produced by certain types of urban functions. The methodology utilized was comparative field research in the nine cities in which research units are located (1).

The functions that were studied are ones considered strategic for urban morphogenesis (civic, religious, commercial, leisure, and mobility uses) because they can produce, modify and layer urban space and because they take on, or can take on, in the different historic eras, different forms and can be used in different ways by the urban population.

Furthermore, these functions confer significant continuity and permanence to urban life.

Reading, describing and interpreting urban form, and in particular the relationship of form with the functions that determine its origins and transformations, were at the heart of the research project, and served as the premise for the project's conclusive result, an *Urban Atlas* documenting the evolution of strategic functions and their influence on urban formation (2).

Preliminary analysis and data collection were broken down into two distinct, but complementary, tasks regarding two scales of urban morphology. The first concerned analyzing form on the urban scale and was based both on the recognition of homogeneous

urban parts regarding the form and character of the built fabric, as well as on the identification of the system of central places and structuring urban relationships. This part of the project also included the survey of significant parts of the urban fabric, and the application of dimensional parameters and indicators regarding internal form, density, and the quantitative relationships between private and public spaces. The second task focused on investigating shaping processes, spatial characteristics and modes and times of use of certain places (so-called space-functions) with morphogenetic value and hosting functions having great permanence over the course of the city's urban history.

These two different readings sought to evidence the diachronic evolution of the urban situations under study, and both referred to three different eras conventionally defined as pre-modern (the city until Italian unity), modern (from Italian unity until 1945) and contemporary.

Rome: morphology and structure

Analysis took into consideration the following elements:

- morphologically homogeneous urban areas classified by distinctions regarding the form of the urban fabric (texture, modularity, complexity, plan form, correlations among the elementary components, etc.);
- infrastructural axes with structuring value in terms of urban form, classified by rank, territorial, primary urban, secondary urban, railroads;
- urban centralities, classified by character and specific content (functional, morphological, environmental, mixed centrality) (3), rank

(territorial, urban, local), form (distinct centralities, linear central places such as commercial or industrial axes, urban space, particular buildings). The morphologically homogeneous urban areas were classified into two principal macro-categories: built fabric and open form. The creation of a shared vocabulary rendered the comparison of the different urban situations more effective and led to the following definitions:

- *urban fabric*, settlement forms in which street pattern and built form are complementary and consisting in the substantial and ordered juxtaposition of street pattern, building blocks and building lots, generally characterized by the alignment (in a parallel way) of the buildings with street axes;

- *open form*, urban form devoid of morphological complementarity between street pattern and building position due to the fact that the idea of city underlying the unitary design of the parts seems programmatically antithetical to the fabric of a traditional urban structure, or because of the fact that during the course of urban development, and for single blocks, the traditional relationship between street and building was progressively lost.

We performed quantitative surveys of urban form on two scales:

- surveys of isolated elementary components selected in terms of the aforementioned morphological categories for each of the three historical aeras;
- surveys of more extensive morphologically homogeneous areas. In the pre-modern city, high floor-area ratios are the result of the compactness of the fabric and its complementarity with the street pattern and open space,

between private and public space.

In the modern city, macro-blocks were surveyed, and the relationship with the corresponding block surveys could not help but take into account the progressive diversification and articulation of different urban settlement patterns. The surveys of elements in important parts of Rome (post-unity and early 1900's) give quantitative numerical value to the progressive expansion of relational and circulation spaces but also indicate the absolute increase in private space, corresponding to the transformation of some traditionally public spaces within the historical city into transitional spaces or into spaces of private pertinence.

The survey of the contemporary city is the most representative in the comparison of the measurements of the block and macro-block in terms of functionalist public building projects. In the block, when this is identifiable, volumetric concentration results in land use ratios with high values. On the other hand, at the macro-block scale, increased open space leads to low values for lot coverage and land use. This attributes a meaning to urban space that can be summed up as a loss of form-pattern and as a passage to 'open' form. In a city like Rome with complex historical stratifications, there are various cases of correlations between urban form, functional and spatial location and content of the centralities. In the compact historical city, the concave open spaces that hosted manifold and different central functions are within the urban fabric, constituting the spatial 'mould' insofar as such spaces originated with the built fabric. The relationship of full formal complementarity between

spaces of complex concentration of urban values and the organization of the built fabric is, after all, an invariant for almost all the space-functions having great social content in the historic European city. When we move to the modern and contemporary city, structural connections show the results of the increasing importance of factors tied to vehicular access and mechanisms of real estate speculation. In fact, many urban policies over the last century favored peripheral location of new projects, infrastructure, and centralities having different functional contents. The extreme limit of this evolution is the location of territorial level centralities with intrinsic social content (though devoid of any real urban concentration) based on mere criteria of vehicular access, above and beyond any relationship of physical correlation with the urban fabric; such are the cases of the new multiplex cinema villages and some commercial centers. These functions, contained in building complexes having singular architectural expressions, become new hybrid forms of 'center' and exert a magnet effect on large parts of the metropolitan territory although they are often devoid of any structuring physical connection with the city that is not a quick access ramp. They tend, nevertheless, to contain, on their interiors, parts and structure which present pure imitation of the the historical city's spatial language.

Rome: function spaces

The sampling of the function spaces studied in the second research 'task' is the following (for every urban function the spaces relating to the pre-modern, modern, contemporary eras are, in that order, pointed out). Commerce spaces: Campo

de' Fiori market, via Cola di Rienzo commercial axis, Cinecittà Due commercial center. Leisure spaces: piazza Navona, Foro Italico, The Village theme park. Green spaces: villa Peretti Montalto Garden, Colle Oppio park, Tor Tre Teste park. Mobility spaces: piazza del Popolo-via del Corso, Ostiense station-via Ostiense, Ponte Mammolo node-viale Togliatti. The single spaces were interpreted according to four superimposed readings: relationships with the urban context; formal characteristics; use characteristics; temporal transformations. Aside from the specificities of the different spaces, certain common elements can be underlined regarding the fundamental characteristics of the functions and the spaces of the different eras. *First.* Some of the urban functions that were analyzed are distinguished by their evolution in which some use patterns remain substantially permanent over the long term while others have progressively assumed, over the same time period, different and articulated characteristics, having different results regarding location within the city and the morphogenesis of urban space. It is sufficient to think about the multiple forms of commerce, leisure time use, civic representation, mobility in the contemporary city. Furthermore, some urban functions, while permanent, are characterized by considerable changes in their intrinsic meaning through the course of the city's history; this is the case, for instance, of the ways of perceiving and using leisure time. *Second.* The changes over time in morphogenetic value of the space for certain urban functions are not so much due to intrinsic variations in the nature of the function,

but to the increase of importance that, in the modern and contemporary city, the conditions of accessibility with modern means of transport have taken on in general. This is particularly true for the function-spaces of commerce, leisure and civic activities that were analyzed in the study. In this light, the disjuncture that we find between the concepts of functional and morphological centralities for some functions of the contemporary city finds substantial relevance. *Third.* In terms of the permanence in the contemporary city of functions and corresponding spaces of the pre-modern city (characterized by being unquestionably linked to the realm of urban public space), new use patterns assumed by some structuring functions seem to point out, coherently with urban globalization trends underway, the increasing privatization of important spaces for urban life, such as polyfunctional containers, malls, leisure time complexes. *Fourth.* The function-spaces of the contemporary city characterized by important socializing content, and that are the result of precise design action, tend towards a functional complexity and internal structural connections indicating attention towards the recovery of an urban spatial syntax, even when they are not true urban 'catalyzers'. This is the case of the Cinecittà Due shopping mall, which includes, within its building volume, streets and plazas, place of commerce but also of leisure, autonomous in its urban design, being at the same time an important functional and morphological centrality. Again The Village theme park and multiplex cinema reproduces a part of a city (a square with a central fountain onto which

the entrances into places of leisure and restaurants open), physically distant from the city but easily accessible from the highway.

Some considerations

The first thing to point out is that the reading and the interpretation of urban structure, necessary for verifying the morphogenetic character of the strategic functions, required the creation of a new taxonomy (insofar as it could not be found in the literature). It was an instrumental task, only indirectly tied to the project's initial idea, which, on the one hand, was perhaps a bit excessive but, on the other, was a useful and instructive exercise. It was useful because it required the different research units to unify their language, also creating it *ex novo* as the morphological analysis progressed. It was instructive because once the same taxonomy was unified, it facilitated the comparative analysis of the different cases and led to some important actions for improving the reliability of the overall analysis. From this, and here is the second consideration, derived a partial reconsideration regarding some doubts about the initial hypotheses. In synthesis, these hypotheses (to be verified) were: the city is born, grows, and is transformed for performing the strategic functions (to exchange goods, to administer society, to manage power, to have fun, to practice religion, to learn, to create relationships) that are its *raison d'être*; by their concretization in physical space (town hall, cathedral, market, stadium, street) these functions produce urban space; through their relationships, they generate the structure of urban form. They are therefore (could be) morphogenetic.

In truth, it is not exactly like this. The structure of urban form is not determined by the locations of, and relationships among, strategic functions. It often derives from ownership maps, from important real estate operations, from the streets that reach beyond or cross the city, from natural elements and reference points, but also from pure chance, or a mixture of accident and chance. Some functions which we do not consider strategic (which, I repeat, is intrinsic to being a city), such as housing or places of production, have, in some historical periods, been no less determining for urban structure than the strategic ones. The same can be said for the functions that are unique, and even genetic, in some cities and not in others: for example, the gate, castle, walls and defensive structure. Nevertheless, by examining the case studies, it is clear that some functions are always strategic, recurrent, and persistent through history. In the last analysis, they are important for the evolution of urban spatial form. As for their effective morphogenetic power, there are (and have been throughout history) many situations in which the structure of urban form is (or was) a result of a series of related causes. The hypothesis that the city is not always structured by strategic functions but that when and where this happens the city works better could make headway. In this sense we might be able to say that the dissociative crisis in the contemporary city has gone hand in hand with the loss of morphogenetic power by the strategic functions. Not by chance do we note that the equation strategic functions = morphogenetic = structuring occurs, as a rule, predominantly in the pre-modern and modern city

(this term should evidently be backdated to the early 1800s if we look outside of Italy to the rest of Europe). In the pre-modern city this happens both in an organic kind of urban structure as well as in the planned kind (planned towns). In the modern city, the new infrastructure representing civic, cultural, transport, leisure functions, become the benchmarks of urban form in the city plans for renewal and expansion (4), while the formation of the new residential districts plays an important role in the creation of urban space (5). In the contemporary city, absolute dominance passes to the mobility and transportation network, with respect to which other functions are situated, in a certain sense, as dependent variables; housing, also continuing to expand, loses its morphogenetic role or it preserves it in an introverted way (i.e. planned districts, especially public housing projects). As far as the conformation of the function-spaces and their morphogenetic effect (for brevity referring only to the contemporary period) is concerned, the following can be stated in synthesis: civic functions (in a general sense, centers of power and political representation, administrative centers, etc.) lose importance both due to the pre-existence of already consolidated centers, as well as to the decreasing importance of the function itself (civic space in the contemporary city needs to be re-invented or re-covered); commercial functions have preserved their strategic importance but tend to self-form or self-reproduce themselves according to their own specific requirements, within enclosures that simulate the city-effect but which have little contact with the real city, both because their position depends almost exclusively on car

accessibility, and because, as a result, they are surrounded by great expanses of parking areas; recreational and cultural functions (from large sports complexes to the 'city of the music') are taking on increasing importance; in some cases they can integrate or be incorporated within commercial functions; they often require specialized spaces and controlled accesses; their integration with the city is much less problematic; green space (in a broad sense) has assumed a strategic importance that transcends its purely recreational function; parks, greenbelts and ecological corridors play an increasingly structuring role and transmit their effects to the surrounding urban context; here we can speak of morphogenetic power; the mobility network is becoming increasingly specialized and hierarchized and, as we have already stated, is the absolute dominant urban element; strategic functions must be located along major networks (it is enough to observe the attractive power of motorway toll-gates or subway stations), but while the search for maximum road accessibility can estrange such functions from the city (with an 'ungluing' effect), accessibility by the collective transport network (for example the railway) can aid their reintegration with the city. Comparative analysis contributes to identifying recurrent elements, the laws of transformation. It helps to understand that if things have always gone in a certain way, perhaps they could have not gone otherwise. Thus it helps to eliminate prejudices and ideological vestiges. In this sense, the documentation of the case studies study gives us some verification (perhaps banal) but we can

summarize it in a few points. The first concerns the nature of urban space, which has enormously expanded, become fragmented and dispersed because urban functions (strategic or not) have become specialized and hierarchized, and because specialization has led to mono-functionality of spaces and buildings and to the social and aesthetic deterioration of exterior space, which has sometimes become residual. Consequently its form has passed from the extroverted to the introverted, from concave to convex as we have pointed out. The morphology of the city has passed from what we have called the form-fabric to open or hybrid or dissociated forms. The second point concerns the so-called centralities: the functional ones have become literally disconnected to the morphological ones; not because the spaces, the volumes, and the architecture of the strategic functions are devoid of their own complete form, but because they are almost always self-referenced, isolated, shielded; because their form is not projected into urban space, it does not propagate its effects on the form of the surrounding space. The third point concerns mobility: since (and really because) it has become the dominant function, a crisis has arisen and it has become the object of more energetic therapies everywhere in the world. This dominance, nevertheless, is destined to remain (despite the competition of the internet technologies) and leads to the fact that mobility infrastructure (from stations to harbors to airports) conforms to its own interior as metaphors of the city interjecting, so to speak, the same morphogenetic power

that, for example, the city gates and post offices possessed in the past. The primary cause for all of this was pointed out by Mumford over sixty years ago and consists in the enormous growth of cities and urban material produced over the last two centuries. This material must be digested or, to use a more elegant term, metabolized: it is a patient and delicate job of metabolization (besides having been already undertaken) and will involve the future of European cities. This history-making process is subject to two contrasting tensions: one that drives some strategic functions (particularly those inherent to the consumption and the mobility) to somehow dissociate themselves from the city and become urban metaphors (or, in the worse cases, caricatures); the other extends to a renewal of the 'urban' through the reinstatement of such functions. Neither one of the two can clearly prevail, it seems; it is more probable that they are destined to coexist within a meeting/confrontation between public planning and private interest that is also of history-making proportions. However there are signs (also deriving from this study) that the metabolization process can occur in a form that might be defined as homeostatic (as has already occurred many times during the course of urban history), developing itself around some of the functions that we have called strategic. There is a strong demand for integrated, flexible, multi-use spaces; the same specialized functions, like those of commerce and exchange, if driven by public management, propose some variations (though subordinated to consumer logic).

In this direction, we believe that the so-called urban projects must seek, anywhere possible, to break down the isolations, enclosures, hyperspecializations, self-referential to recover a form-fabric that will no longer be (and can no longer be) that of the ancient city, and to propose a new network of relationships with urban space. In this sense, we repeat, the initial hypothesis regarding structuring strategic functions rather than a model 'of state' might represent a programmatic model.

*Antonio Cappuccitti wrote the first, second and third paragraphs, Elio Piroddi the fourth.

Notes

1. The research project *Morphogenesis of the urban space. History, Uses, Project* involves nine research units in as many university centers. The national level coordinator is E. Piroddi, the local coordinators are: F. Bronzini (Ancona), F. Selicato (Bari), R. Busi (Brescia), G. Deplano (Cagliari), P. Di Biagi (Ferrara for the Venice group), P. Giovannini (Florence), B. Gabrielli (Genoa), P.P. Balbo di Vinadio (Reggio Calabria), C. Mattogno (Rome). The final result of the study will be an *Urban Atlas* regarding the nine cities (in press).
2. In this sense, the atlas will not have the encyclopedic ambitions of the great atlases in the history of the urban studies from the Enlightenment on, from the *Atlas Général de la Ville de Paris* (1793) to our Morini of two centuries later, but will document the results of the study without relinquishing the inherent iconographic value of such a publication.
3. It is worthwhile to denominate functional as

the centralities that are essentially defined by the presence of the function itself without important consequences on urban spatial form; morphological are those that, also in the absence of important central functions, define a spatial junction of primary urban importance; the presence of these two characteristics denotes the more important centralities.

4. On the subject see G. Zucconi, *La città dell'Ottocento*, Laterza, Bari, 2001, chapter 4.

5. The quantitative prevalence of the residential function in the formation of new urban structures is obvious and, therefore implicitly, also its shaping role. But our point of view is that it is always a matter of a function, so to speak, induced through the genetic factors of an essentially tertiary type that are at the root of urban formation: those factors that here we have called strategic functions. (see on the subject C. Aymonino, *Lo studio dei fenomeni urbani*, Officina, Rome, 1977, pp. 46 and following).