

GEOMETRY AND LIFE OF URBAN SPACE

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Abstract

This essay introduces rules for building new urban squares, and for fixing existing ones that are dead. The public square as a fundamental urban element behaves both as a node and as a connector of the urban fabric. Like the components of an organism, each urban element is itself highly complex, and this conception contradicts postwar design trends based on abstract simplistic ideas: those are imposed in order to control instead of stimulating social life. Urban structures, infrastructure, human beings, their activity nodes, and all their interconnections come together to form a “super-organism”, a complex and dynamic whole that is the city. This happens only when the geometry of the urban fabric is encouraged to develop in a living manner. The basic element of this “super-organism” is urban space that works with informational processes. In European culture, the square connects the local urban space with other squares, streets, and roads with a strong pedestrian use. A living city works through its connections to reach the properties of a “super-organism”.

Introduction

Public space represents a common value, a meeting place, even and especially in the information age. The vision of a common area allows and reflects society’s condition of wellbeing. There exist basic principles for designing urban spaces. These principles can be discovered from different sources: studying historic squares, studying human biology, and the needs of interacting in an open space. The “design plan” has little to do with creating a plaza

that transmits urban life, despite all the bad examples of dead “hard” squares built in recent decades.

Urban fabric has biological characteristics. It represents a “super-organism”, a complex structure that is created by combining space with human beings. In fact, common space is the next-largest socio-geometric structure following that of the individual and his/her family. As the fundamental unit of human society for thousands of years, a socio-geometric element is not merely a construction intended as a container of movement. Despite our virtual electronic society, we humans haven’t lost the need for social relationships. Urban space therefore is not a superseded element of life.

A super-organism is found in all social animals such as ants, bees, humans, etc. These animals develop a hierarchy of structures and allow the creation of a superstructure that helps the individual to survive, although being a member of the super-organism must sacrifice some freedoms. The super-organism has emergent properties that are impossible to activate when individuals are detached from each other. It becomes a living entity on a much larger scale, with an increased complexity compared to the isolated individual.

Humans have always been aware of these facts. Yet since the Second World War, society is self-destructing by cheerfully applying anti-urbanism. The values of urban space have already almost disappeared. Imposing an absolute geometry produces an urban design on paper, but which in perceptual reality loses the factor of human dimensions. Moreover, monofunctional zoning based on the exclusive use of the automobile was adopted by personal interests coming from speculative politics. A massive construction campaign has encouraged this disastrous view in order to build vast areas of suburbs and apartment blocks: those now represent useless and unrecoverable urban fabric, due to their geometry being fundamentally wrong. By losing the rules of urban geometry, our civilization has lost the urban structure that permits us to have human society. The urban periphery today contains only isolated individuals with no connection to any society.

Urban space is even sacred, because it constitutes a link between geometry and humanity. Our interaction with the environment comes from our evolution in the open spaces of the Earth in prehistoric times, subsequently applied to define the open spaces of the city as an extension of our ancestral open areas. The same feelings and neuro-psychological reactions are valid for both contemporary and historical cities. The building fabric therefore needs to respect our perceptual biological system responsible for linking us to forms and surfaces, developed as a result of our being biological human animals.

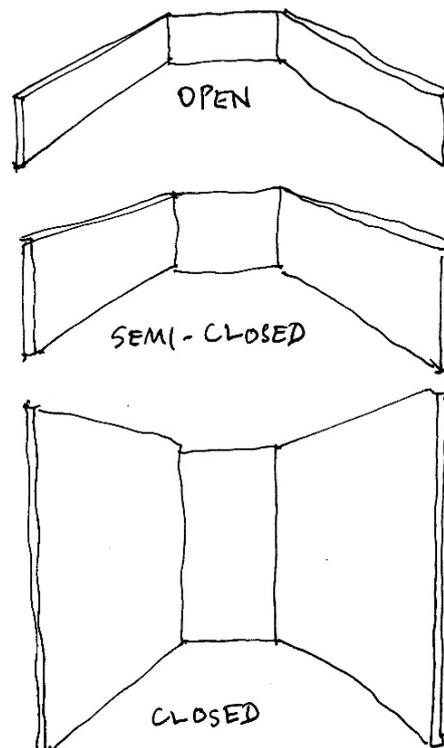
Unfortunately, several generations of architects have learned an approach to architecture and urban planning in school that destroys urban spaces (Pagliardini *et al.*, 2009). They are committing an innocent mistake. Architectural education is geared towards abstract design concepts and is unaware of the destruction of urban spaces. Towards this purpose, all building and zoning laws are now formulated in a way that is unfavorable to urban space. The intention as formalized in society’s regulatory system has become a tool for self-destruction. It is normal that purely economic interests make big profits and have no intention of changing anything. Commercial interests have stolen and have erased public space, to then recreate it within private boundaries, while knowing full well that human beings need this space to live.

Some elementary principles

The principles for designing urban spaces are very simple to explain. We propose that an urban space has two key features: (1) degree of openness, and (2) degree of interiority. These phenomena have precise neurological and physiological value, namely, as reactions that are perceived by the human neurological system. For this reason, we analyze here not with numbers, nor in an abstract manner, but with strict relevance to human perception. Our analysis is very different from how architecture is taught in the schools, which focus on analyzing only abstract designs, following an attitude that has nothing to do with the physiological/psychological response of the city's inhabitants. It is not surprising, then, that the majority of new buildings have alien and dehumanizing characteristics.

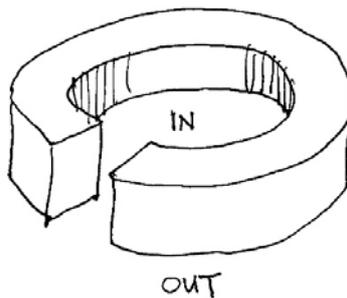
First we see the degree of effective openness in a space surrounded by structures, whether they are buildings or walls (Salingaros, 2005: Chapter 2). Urban space is always open to the sky, ceiling-less, and we analyze the effect of closure as perceived by someone using that space. It is evident that the feeling changes dramatically when the walls are high. This perceptual effect is a function of the ratio between open space, the height of perimeter buildings/walls, and the scale of the human body and its movements.

Figure 1. Range of closure and openness according to the relative height of walls surrounding an open space



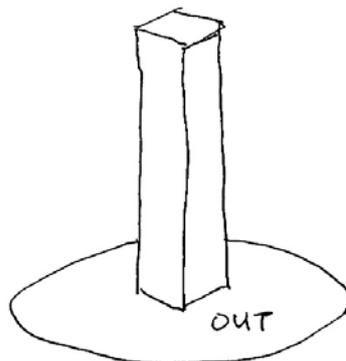
Without entering into a technical analysis, it is obvious that the user's perception of an open space is optimized with rather low buildings. The proportion of open space compared to the height of the surrounding buildings determines the size of the square, which cannot be too wide; otherwise you get an effect of discomfort. We have to avoid the imposition of inhuman dimensions, often coinciding with urban blocks that are much larger than traditional ones. Then there's the physiological/psychological perception of interiority: does it feel like being "inside" or "outside" in an environment containing both natural and built structures?

Figure 2. Building fabric surrounding an urban space. The space is "inside"



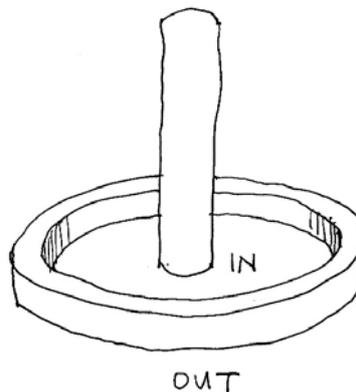
The elementary method of defining a "protected" open space with a sense of interiority is to surround it with structure. This is the primordial open space that both animals and humans search for to carry out their activities outside the nest/house, but always in a semi-protected environment. We understand that in an urban fabric, the ring that defines public open space can have any shape, and especially many inputs and outputs. The border is highly permeable to routes, while the built ring surrounds the space to give the needed psychological effect. In addition to the effect due to the constructed elements, a square is "protected" from vehicular traffic (which would raise anxiety in the pedestrian) when roadways are tangent on one or at most two sides.

Figure 3. Empty space surrounding the built fabric. The space is "outside"



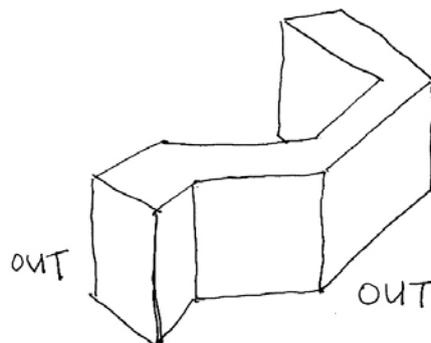
The opposite geometry is achieved with an isolated structure, the most damaging of which is the modernist skyscraper. All the space remains outside and is thus exposed. A person in this exposed outer space strongly feels a lack of protection in a geometry that is too open. The space is insufficiently defined to provide a “refuge” even in the minimum sense. Linked to the skyscraper there is always the false idea of liberating open space and leaving room for green, and that the skyscraper, with its surrounding space, represents the solution against small traditional buildings that consume the land. Nothing is further from the truth, and this is a serious misconception. The open space around the isolated building, whether it’s high or low, is useless.

Figure 4. Converting an open space that is “outside” into an open space that is “inside”



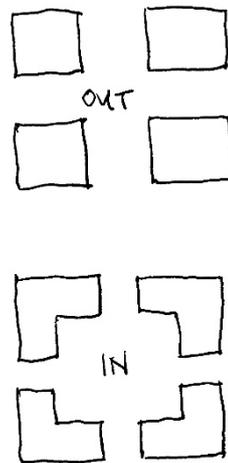
The space outside a very narrow and thin tall structure could be better defined with fabric built around the space. It is not, however, the solution to the problem of the skyscraper, because its dimensions are usually too big. A square with the right proportions around a skyscraper becomes much too big and exceeds human dimensions by several times. This solution is useful instead applied to a monument or a very large tower in the square, but not with a skyscraper.

Figure 5. Pathological typology with all of its external space “outside”



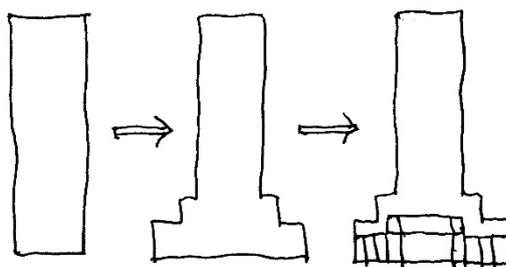
We recognize here a pathological building typology of multi-storey buildings that was widely applied after the war. This typology, despite its universal prevalence, destroys urban space. There is no public room that feels “inside”, and consequently all the optimistic expectations of so much open space in which to walk, play, and enjoy nature failed because the geometry is too exposed and the building is too high.

Figure 6. Development of open spaces from “outside” to “inside” following the plastic deformation of the built fabric.



It is easy to define an open public space through deforming the shape of the buildings' footprints. Here you can see how a plastic deformation that develops some isolated blocks ends up with a much more complex built fabric. At the same time, the urban space becomes much better defined. We must, however, overcome a design prejudice that privileges the building's footprint rather than the shape of urban spaces: you can't have both, and, obviously, you have to sacrifice the abstract and formal plan of buildings to obtain public space. We just pointed out a selfish conception of a building that does not wish to engage with the community of which it should be part.

Figure 7. How to connect a tall building into the urban fabric using a complex base on the human scale.



Given that inserting tall buildings into the urban fabric is nowadays more and more common, we have to think of how to do this in order to limit the damage. Instead of the detached building defining an open space all “outside”, we can establish its base on a more human scale. Then, the geometry of the tall building’s base may be used to define urban spaces, something that would be impossible if the building retains its “purity” of form. A connective urban fabric that is predominantly low-rise can help a tall building to become part of the city. Nonetheless, a building that is too tall creates problems for urban movement and for the urban geometry that are difficult to solve even with an adaptive base.

Public squares: the biological analogy

A most suitable representation of the structure and functioning of the city is to think about it as the body of an organism. Even the graphical representation of an electronic network looks awfully organic, resembling neural connections and biological forms. The plans of historic European towns have organic shapes and never even remotely recall an object designed and built in the laboratory. Trying to understand the causes of such complex phenomena involves aspects of anthropology, biology, nature, society, and economics. It also involves the dynamics that develop between thousands of human beings, each with their own freedom, their own needs, their own feelings and affections, their own will, and their own interpretation of reality.

In science, we advance hypotheses and discover laws and invariants that repeat in time and space, which help us to grasp and understand nature. We can determine the reason for certain dynamics and certain similarities, leaving the answers to everyone’s convictions and sensitivity. We can largely understand “how” these dynamics occur, what are the results of those that have already occurred, and also predict those in the future. Disregarding such evidence testifies to the desire *not* to want to understand, in the name of an ideology and/or a preconception. The working city offers alternative choices of channels of movement as a very complex system, although its functional complexity is often hidden under physical forms of apparent simplicity.

The public square is an almost exclusively European phenomenon, daughter of a culture that created its shared collective themes with conscious aesthetic intention. And it did so by including them in a continuous and smooth fabric of spatial relationships. Only rarely was a square created for specific functions, such as a sanctuary, or a country Palace, as a single instance isolated from the urban phenomenon. Even with such isolated instances, those are always tied to emerging territorial or geographic nodes, placed at special points along major thoroughfares. The Cathedral and/or Town Hall rose in the main square. Today not even the ecclesiastical authority has managed to preserve and pass on these symbols of power and faith in the city, but instead builds churches that resemble gymnasias in the midst of open parking lots, thus degrading religious architecture to mere function, and the ecclesiastical community to mere participation.

We cannot help but note that the conditions of contemporary European society no longer allow the common and shared values of public and religious space, which historically characterized the European city. These powers have lost their symbolic representation. Take for example the European Parliament building, a building that could be an office building of any large company.

As a typical product of a “cold” industrial process, its total lack of architectural character prevents any positive connotation for the place in which it rises, and it does not even add character to the institution that it's supposed to represent and qualify.

Those older public collective themes were superseded by other private group themes, such as commercial and office buildings and places of cultural consumption. It is not the job of the architect or planner to determine if that is right or wrong, nor to try to change things, because that would be impossible. Complex social phenomena cannot be dominated by the architect, even if he/she wanted to. Nevertheless, the architect's task is to shape urban space so that it welcomes those complex social functions, and to replace a now-lost spontaneous consciousness with a critical conscience, by introducing a new critical approach discovered thanks to the study of human structures.

The shape of the public square does not substantially change its character according to the new needs of individual mobility and the movement of goods, and it does not matter — from an urban point of view, of course — if today a large clothing store replaces the Church. In that city men and women will always live along with their emotions, their feelings, and their perception of space. If they can carry out their consumerism in a place that has the proportions and spatial relations of a European square, they will feel more at ease and receive greater environmental wellbeing than inside a big-box supermarket. We are taking into consideration the role of the building as a visual reference in the urban sequence, directing pedestrians to the next urban space.

Moreover, the city will work only if it has a network structure that allows the greatest possible number of relationships. For this reason, new settlements will not be born spontaneously with this property, at least not in the Western world. The most beautiful cities in Europe (which are among the most beautiful cities in the world) were indeed born spontaneously, that is, not designed by an individual assigned to that task. New settlements must be designed according to those rules that lead to real public squares. The idea of connective structure (as referred to in this essay) should guide the project, and the usefulness of a square stems from the proportions of the perimeter “curtains” in relation to the size of the square, in addition to the urban fabric that determines the form on a plan. We need a very different kind of design, which includes rules linked to self-organization. This has to do with a whole new concept of social participation.

The proportions are the heights of the buildings: those cannot be too low if the square is large, in order to give the perception of enclosed space; nor too high if the size of the square is small, so as not to give the perception of this being just a wide stretch of road. The square represents in urban space what the living room is inside the home; it is a living room whose roof is the sky; it is the public place where you receive and meet people, where you set up a meeting. The public square must however be immediately recognizable through at least one or more characteristics. Beginning with a more or less regular shape, then the prevailing building typology may be either linear, or of a dynamic and irregular shape, or a monument, a fountain, or a building representing a collective theme. It may be that the roads enter the square in a way that is not perfectly symmetrical.

In any case, the square must be characterized by empty space and not be filled up by an assortment of objects that are as useless as they are damaging to the perception of spatial

unity. Those objects are requested and are promptly put into various architectural competitions. The square will eventually fill up with popular activity on certain days of the week, or during certain hours of the day when such a square becomes the market place, for example.

The square as the “hub” of society

The square is a characteristic and specific singularity of an urban space, being a spatial and visual reference within the city. Today we might call it a “hub”. A hub can be an international airport toward which many medium-haul domestic and international flights converge, and from which the long-distance routes depart.

In computer science, a hub is a box where a main network cable arrives, and from which depart many cables to local computers. A hub is also a popular Internet site that serves as a starting point for jumping to many other less frequented sites.

The hub’s logic underlies the Internet’s electronic network because, as the network is itself interconnected, we could claim that it is theoretically democratic and horizontal. It is equally true that there are nodes (hubs) that create a hierarchy and allow you to move through the Internet more easily and in a structured way. Facebook is a hub for gatherings of friends and for making new friends; but there are also hubs within Facebook, groups that collect people who have a common interest or a common cause and from where they share other friends and/or other interests. Therefore, the electronic network is a horizontal connection where everyone can connect with everyone else, but structured as a hub so that you can navigate and orient yourself better from secure reference points. The Internet provides the greatest degree of possible choice, with a high degree of organization, spontaneous because it is unplanned, and not compulsory. It offers the widest choice and freedom of relations; it is at the same time democratic and hierarchical, free and structured.

When we speak of the public square as a hub, we can further imagine it as a connective node in the virtual space of the electronic network, hence of virtual social networks. Although you can enter the Internet from any computer located at any site, an Internet café situated in a square coordinates the nodes of the physical network with those of the virtual network and creates a connection and marriage between the physical and virtual worlds.

Urban society is possible only thanks to the presence of the square, the hub of the urban fabric. A hub is literally a pivot around which a bearing or a wheel revolves and thus it is figuratively a “center”. The center is also the core (the deep center), which is the heart. The heart is of course the hub of the human circulatory system. The city’s circulatory system consists of the streets, the most important of which converge in the main square if the town center is small, or in the various squares if the city center is bigger, and then these will have their own specialization and obey some hierarchy among themselves. (We don’t include highways here, because their flow detaches them from the urban fabric.) There will be the *Piazza del Duomo*, the *Piazza del Comune*, and the marketplace, which may coincide with one of these two; there will be smaller squares characterized by the presence of a collective theme, a church, a prominent building, and the square where traditionally popular events are held.

But the presence of many functions — even important ones — is not sufficient to define an open space as a public square. The plaza requires three essential conditions:

Firstly, its origin should stem from a road network system that determines a node (hub) in a specific location, which we call the square.

Secondly, it is an area whose perimeter is almost completely enclosed by a curtain of buildings, with the exception of the roads that enter.

Thirdly, the urban fabric and connectivity guarantee activity on the square's edges, with favorable environmental conditions (not too much noise or vehicular traffic), with active ground floors across much of the perimeter, and human-scale structure in the urban fabric that defines the border.

The definition of "node" is quite intuitive but if it's not clarified conceptually it can lead to misunderstandings, as, indeed, often happens. A node is any singular point of a continuum, determined by the intersection of two continuous flows, or from the budding off of one flow from another. The node will be the intersection of two paths, or the bifurcation of a path, or even the impact between two different kinds of paths (Caniggia & Maffei, 1979; Salingaros, 2005). This intuitive definition of node is here identified as a hub, as a singular spot in its own right that draws in and exchanges flows, but also as part of a complex system of relationships among a set of urban paths, or urban network, which has continuity and organic coherence. The public square, in order to be truly such, must lie at those network points that give the character of a node according to precise rules governing the central flows among social nodes. The nodes extend to various human activities: home, work, the green park, the store, the restaurant, the Church, etc.

The other essential condition, easier to verify and to respect, is closing an urban space's perimeter with continuous building fronts, except where roads enter it. There are also larger openings, for example, in the case of squares arranged in such a way as to create two distinct spaces yet integrated enough to seem like a single square. In the medieval town this is known as the system of square and counter-square (*piazza e contropiazza*).

"Open-source" rules and the city-as-organism

There is a fundamental connection between "open-source" software and a vision of the city-as-organism. The culture of public design implemented top-down could change dramatically (and for the better) if we introduce another approach (Pagliardini *et al.*, 2009). So far, urban planning was not open to public participation; sometimes local planning involved groups that did not have access to the rules that create the urban super-organism. The paradigm of post-war planning has always been controlled by "experts" who, despite their credentials, have built unlivable urban squares. Let's not continue to give those experts the possibility of applying rules lacking explanation or logic, which are instead shrouded in mystery.

Exactly as in the case of proprietary software, the code remains hidden and is therefore a mystery. This situation lends itself heavily to abuse, because concerned common people do not know the rules of urban design that are applied to form their city. By contrast, open-source software is open to everyone, and is therefore transparent. A city adopting open-source urban design rules can be sure of doing a much better job. There are no mysteries, and this approach avoids major mistakes, like putting the town under the control of a private company or a group

of “experts”. The city pays a very high price for applying defective town planning rules without knowing it. Contemporary design practice works with formative rules and data closed to citizens. Such considerations are consequences of the movement “P2P Urbanism” (Salingaros, 2011). This develops participatory processes of self-organization working together with formal processes: the essential distinction is that citizens have access to the right rules. The model of open-source rules would have a revolutionary impact on urban design, opening up the process to a wider audience. Citizens interested in the design of their cities can follow the planning method in the future. A new participatory dynamic, with authority based on rules derived from observation and not those of a private company, will open the structure of the city to the light of adaptive solutions. We believe that the result would be much clearer and deeper.

These rules, which have a scope of action on the small urban scale, arise from interest in human health and wellbeing in the urban environment. Wellbeing results from the complexity of the various scales of perception in terms of architecture, and urban scales with regard to the quality of life in cities. Open-source practice will truly work if people get training — at different levels of detail — on the very essence of being human, on wellbeing, on what is true and good, and on the common good.

“Design a new square”: we often hear this slogan repeated by administrators and architects. There are even mayors who wanted to create 100 new squares! They intend to make these new squares without building a large town from scratch, of course. Those new squares are envisioned without the adjoining city but above all without any relation to the fabric of roads, and probably without even enclosing them between surrounding buildings. Those administrators intend to create empty spaces, furnishing them with fashionable flooring pavements, designer benches and lampposts, and some covered pavilion that is as useless as it is highly visible. All this to demonstrate to the citizens their own (the administrator’s) interest in their city, assigning to those areas (which could become useful spaces only with great difficulty) certain functions that they believe are enough to establish that they have indeed made new public squares.

“Function” is the watchword of the urban planner and administrator. Town planning becomes a game of fitting things together: here I put culture (even though they don’t even know what it is), over there I put the space for young people, there a performance centre, there a Museum; no, maybe it’s better to move the culture over there because it’s better for it to be in the historic center, and instead I’ll put here a Senior Center. Altogether, choosing different functions and situating them in the new or old city is like deciding on which clothing and accessories to wear to a party.

This frenzy of functions imposed from above, which are then regularly assigned to some public square before becoming a kind of conditioned reflex and a cliché, originates deeply in the imbalance of our society. Today we fail to express strong and shared civic values. Contributing to this crisis, political power does not have the necessary authority to transmit to the people it administers an interesting and enthusiastic idea of the city. Political power fails any longer to convey emotion to the citizens, and so what matters is the image. The slogan of new squares is useful perhaps to win an election campaign and to hold onto high ratings in the polls for a little while, but when put to the test, those techniques can only translate into a political failure and,

more importantly, into urban failure. You can't produce urban quality by following the ideology of monofunctional zoning.

The rest of this essay collects a list of rules (in three parts) that can be applied to design public spaces in any place or situation today. In addition to creating a contemporary plaza full of life, the program of inserting these new plazas in the city generates "society". That is to say, with a new network of pedestrian activity focused on the nodes of public squares, the whole city fabric comes to life: we create the urban super-organism through public squares.

By following the correct design rules, we expect a positive transformation of the city in the new millennium. Above all, we believe it is the right way to breathe life into the suburbs. Indeed, the repair of reckless town planning can lead to substantial results and benefits for those public administrations able to revive the fortunes of the local economy. We can learn from examples in Latin America, where public funds are used to build an extensive network of public squares and gardens for the people's recreation.

Rule 1: General characteristics of public squares

- These spaces must be constituted of urban nodes, insofar as they are junction points of primary or secondary roads.
- Due to their nature as urban nodes, they must be easily identifiable spaces in the city's structure.
- They must be spaces with a high degree of connectivity, connected to the rest of the urban nodes and the rest of the city's lattice structure through both pedestrian and vehicular traffic.
- They must be spaces of high pedestrian permeability, which means that they must be easily accessible and open to pedestrians.
- They must be spaces of vehicular permeability, encouraging both their limited traversal as well as vehicular movement on their edge. This movement is maintained between narrow limits that guarantee *access* instead of *transit*, so that vehicles disturb neither pedestrian access nor the quality of pedestrian circulation.
- They must be highly versatile spaces, allowing the development of all kinds of public activities in their interior: political, recreational, cultural, religious, tourist, etc. The application of mixed functionality must extend also to the ground floors of many of the surrounding buildings.
- They should welcome a set of conditions for mixed uses in both their perimeter and in their interior, to allow the development of a wide range of citizen activities: religious, business, recreational, political, tourism, administrative, residential, hospitality, etc.
- Some of these activities could have a major bearing on the others, in which case those can be designated as "anchor" activities.
- These spaces must contain the high-quality symbolic, aesthetic, and historically-significant urban points, giving them a great capacity of perception by citizens. Squares play an important visual role in orienting the sequence of urban spaces.
- These spaces should offer a wide range of sensory experience to users through their architectural and urban characteristics.
- These spaces, through their architectural and urban design, should allow a customization of the user experience, so that every visitor sees and perceives them in a unique and personal

way, maybe different from the experience of others, and so the public space can become personal space.

- The personalization process — the individual perceptual appropriation of the space — should lead to a collective personalization, so that the space may acquire a general identity, as happens in historic town centers.

- The architectural characteristics and urban design properties must make these spaces safe for the population (from the point of view of crime), to ensure continuity and permanence in their use. Removing business to shopping malls in outlying locations removes it from the streets, and consequently, over time, the safety of citizens who use their city as pedestrians is greatly reduced.

- There is a need for easy pedestrian access along the streets leading to the square, in a region of at least three adjacent surrounding blocks, with sidewalks that are specifically designed to be useful in “feeding” pedestrians to the square.

- There is a need for mixed activity in an area of at least three blocks surrounding the squares, with a significant percentage destined for residential use. This is necessary to ensure the vitality of the square even when public buildings and businesses are closed, for example in the evening hours.

- The community needs to intervene through participative planning in the process of detailed design of squares and the urban environment.

Rule 2: Specific characteristics of new squares

- Their shapes and sizes will be similar to the gardens and traditional squares of modest size. The correct definition follows the proportional relationships between closed and open, width and height, based upon human perception. The bad examples are visible in dead oversized urban squares.

- Each square can contain vegetation planted at ground level, and trees, wherever possible according to local conditions. It is possible to realize a public garden instead of a square in a city, or to have a range of mixed types between the two.

- Parking can be tucked away in the back of the surrounding buildings, in exceptional cases in the basement of blocks, but should never be around the square.

- At least one side of each square must be intended for general vehicular traffic, whereas in areas with strong existing pedestrianization the road contact can be tangential to a corner.

- Vehicles are excluded from the rest of the square, with access only for security, emergency, and delivery vehicles.

- At least one side of each square must be intended for purely pedestrian circulation.

- On the other sides, the interface with the vehicles must be structured so as to offer psychological and physical security for the pedestrian.

- The roads destined for vehicular traffic next to the square must contain suitable sidewalks (that are wide enough) for pedestrian circulation. You have to control the width of the streets and sidewalks to clearly define the priority of the square as pedestrian space.

- At least one side of each square can be designed as a portico/arcade (with solar orientation depending on the climate).

- The buildings that make up the environment surrounding each square must be able to rely on three floors maximum height (or a height equivalent to three normal storeys). The exceptions are those buildings that represent singularities, such as steeples, towers, major public monuments, churches, etc.

- The buildings that surround each square should be physically permeable in various ways, through many doors and windows, and avoiding impermeable glass walls, which provide façades transparent to visual contact but closed to human movement.

- The internal geometry of each square must be determined by several footpaths, well-defined, direct, both straight and curved, as in the traditional paths found in historic gardens and squares.

- The internal geometry of each square cannot be defined by the canopy of trees, by vegetation, or typically by the street furniture; these items will play a complementary role to the design or model defined by the paths, and serve as support for the importance of the paths. This point is less important if the square is entirely paved, but be careful not to insert an item that generates interest but which conflicts with the network of paths.

- The paths of every square cannot be “drawn” as objects of a template defined in the office, but are necessarily determined only by walking in the spaces themselves. Except for existing trees, the paths are laid out after walking around the square before inserting anything. First you let people walk where they feel better (on the square before its design is finalized), without preconceptions about design or formal geometry, and afterwards these paths will become permanent.

- The possibility of symmetry breaking should be left open, abandoning a formal design of simplistic geometry with bilateral symmetry. We seek an organized complexity in design that is not enforced, but which develops from the adaptation process.

- Street furniture such as seats, benches, and other structures must find their relationship with traditional urban furniture, avoiding the use of high-tech items and structures with a modernist industrial look. This rule comes from Biophilia, not personal preference (Kellert *et al.*, 2008; Salingaros, 2015).

Rule 3: Architectural forms for the environment

- A design language typical of the traditional forms used in local architecture should be researched and adopted, along with the use of traditional and natural materials, local symbols, and artisan crafts. We should avoid the use of steel and glass except in very small quantities and at a very small scale.

- Try to use vertical openings in façades, abandoning the massive dominance of gaps. Without imposing any particular architectural style, the façades must be designed in a vertical sense, avoiding large horizontal structures.

- A varied building fabric must be sought, with different buildings constituting an urban front instead of a single building, so that the urban variety becomes attractive and rich.

- Nodes of interest around the square stimulate people to cross the square in all directions: thus, you have to guarantee visually interesting entrances, attractive pedestrian exits, visual landmarks, attractive tactile points, etc. (Salingaros, 2005: Chapter 2).

- Nodes of interest inside the square must be approachable, offering the facility of standing or sitting next to them. For example, a monument should possess a base or steps on which to sit.
- The success of a square depends primarily on the surrounding nodes of interest more than from the internal ones. It is therefore a mistake to fill the square with structures or objects of “design”.
- You must utilize frames, moldings, and solid borders in the surrounding façades, just as in traditional architecture, following a solid tectonic sense of definition and not as mere decoration.
- Use traditional colors for the whole place, including all the structures situated inside the square, as well as on the external built fabric fronting the square, thus establishing a relationship between interior and exterior built spaces.
- The environment of the square must be rich in ornaments, employing traditional local types of decoration, and including balustrades and grilles in the public gardens.
- Surrounding commercial advertising should be subject to the criteria of scale and traditional design in shapes, colors, and typefaces, and avoiding the use of neon.
- Advertising should be banned from the square’s interior.
- Urban space is not just a container of activity but must itself be the space of socialization for the community.
- Successful public space becomes social life in itself; an understanding that goes beyond thinking of this as simply a space for social activities.

How the smaller scale influences the larger scale

It is possible (and perhaps highly likely) that some readers could be surprised by the emphasis we put on little things, like the details of ornamentation in the squares, on the color, on the lamps, benches, etc. This is not a simplistic point of view nor is it trivial. According to the hierarchical theory of scales that constitute a complex system, the minor scales have a major influence on the larger scales (Salingaros, 2006: Chapter 3). For this reason, it is sufficient that the design of the lamps in the square be high-tech and minimalist in order to ruin the overall experience. People feel discomfort and malaise being in such squares, as a result of the lack of connectivity with these industrial-looking objects, and they therefore cannot enjoy the open space. The square becomes dead.

We have to discuss details because today it is no longer possible to expect a gradual realization of the square, the work of many centuries and many social actors. It is more realistic that a single architect will be commissioned to design a new plaza. When the project is based on geometrical rules of organized complexity using a variety of elements, even one contemporary architectural hand can create a design that resembles in its essential elements the historical development of urban fabric. We propose those evolutionary criteria in an intentional design method for the city (Pagliardini *et al.*, 2009). Using the correct typological and morphological rules we believe that you can even guarantee the coherence of a collective design driven by many hands. If we can succeed in formulating a unified plan, we can reproduce unity in diversity.

Almost all designs for new squares contradict our rules, introducing high-tech furniture and objects on purpose in the open space. According to design ideology popular in recent decades, the explicit aim of new interventions was to introduce a high-tech object such as an abstract statue or an industrial style porch in order to “renew” a historical square. The result has always been a disaster, because the geometry of those objects — despite having much smaller scale — contradicts the geometry of life. Consequently, people stop going to that square. They don't realize, however, that the motive is indeed this new sleek steel and glass pavilion, or the smooth abstract metal statue of which the Mayor is so proud.

We do not focus at all on stylistic matters having to do with beauty, or even with individual concepts of aesthetics of architectural language very different from each other. Our attention is turned purely to structure and its biological impact. This is a problem of biophilia: the human physiological/psychological response to the environment (Kellert *et al.*, 2008; Salingaros, 2015). Although we are forced to ask the question in terms of architectural language, we do not want this to overshadow the heart of our message, which is not about style, because we do not wish to fall into sterile debates. All architects and students fascinated by the contemporary project can learn to design in a humane manner if they respect essential structural elements of space and process.

We propose a radical change of society as a function of the city, because we want a square to reach its maximal connective quality. Beauty cannot arise unless there is an absolute reference value. If a general cosmic vision is missing, how can we provide a group of human values? Our society does not find in itself the foundation of its own values, it does not find them in relative truths and, if it wants to discover a soul, it must sink its roots based on nature and absolute values beyond fashion. Since spontaneous consciousness has been lost, we appeal to reason to build a better and more beautiful city.

A fundamentalist mistake

The purpose of most new squares and urban interventions is, in fact, pedagogical: erecting industrial “design” symbols so that people are exposed to them. Those architects and urban planners who do it are totally convinced of the redemptive qualities of objects of faith having an industrial appearance. They sincerely believe they have to place those objects in the middle of an open space to give it a sacred quality. This is an act of faith in the vision of an industrial world. Not surprising, then, that designers motivated mainly by their faith in the sect deliberately ignore the real conditions of how an urban space works.

We face a problem that goes beyond the planning of urban plazas in order to understand how man deals with his surroundings. Humans need to connect to the natural environment, to connect with the structure of organisms, as we know from the concept of “biophilia” (Kellert *et al.*, 2008; Salingaros, 2015). For this reason, having nature present always adds life to a square. An unnatural structure, however modest, unfortunately suffices to cancel that connection: for example, a large industrial style vase or the industrial edge of the bed where a shrub or bush is planted. The natural complex geometry of the plant is annulled by the minimalist geometry of its base. The same thing happens with an industrial style canopy or

kiosk introduced into a square. Those can look beautiful in pictures, or when seen as abstractions, but the experience of standing next to such alien forms is completely different.

Where social insects construct their super-organism (their colony), they need physical materials with specific attributes to build it. In the urban case, the human social super-organism depends on informational relations: to achieve those, traditional town planning, architecture, and ornamentation encode and concentrate a lot of information. By contrast, the products of contemporary design are deprived of organized information on the human scale. Made abstract objects are not adaptable to other structures, and they are not adapted to become components of an organic complex. You can't use elements that do not connect to each other (because those are self-referential) to build a more complex structure.

The harmful action of this important phenomenon is comparable to the action of a virus. It suffices to introduce a virus within a complex organism of large size. The virus is able to replace the complex structure of the organism's components with copies of the same virus, and eventually the organism dies. The same thing happens with the introduction of high-tech objects into a square: the minimalist "look" is transmitted as a virus to all the surroundings. It is very easy to spread "design" style like a disease; we refer for example to the style of the lamps, benches, slabs and tiles on the pavement, or to the design of the walkways which becomes formal and stiff, contrary to our suggestions for organic trails that determine the environment. If we're not careful with the small scales, we can spoil the whole.

The square as a common good

A square will succeed socially only if people take emotional possession of it and feel at home. Users must connect with the physical structure of the square to a degree so intense to the point that the square becomes common property in the sense of common "goods". When the urban space belongs to the people, it is protected because it is considered a valuable possession. The deeply-loved character of urban spaces in traditional villages cannot be regarded as absurd, as some say. Shared quality is the only attribute that has the ability to connect the village to the people at a larger scale, thereby indirectly, regardless of the direct relationship among individuals. These are the qualities we must seek in constructing new squares. Therefore, we do not take into account squares that are not liked since they are products of "design", despite the fact that the designer might be a noted architect.

Biophilia teaches us that we are made to connect with living things: plants, animals, people, and even artificial products that represent the geometry of life. These objects and architectural surfaces may be quite abstract, as in the case of Islamic architecture, yet are full of organized complexity. We cannot, however, connect with abstract empty shapes and blank walls, or forms alien to human neurophysiology. Everyone knows this, although fashionable architectural forms of "design" appeal to many politicians and intellectuals. In the past, there was a widespread consciousness of beauty and comfort, and there was certainly no need to talk about what allows us to appropriate urban space.

Unlike the current design philosophy that ascribes a prevalent meaning to the function for which a structure is designed, we insist instead on emotional connectivity to give a structure meaning. A structure or public space acquires a timeless property only when it is intimately accepted and

possessed emotionally by the people. The function itself is secondary; in fact, we should expect that it would change over time, while the deep sense of ownership will remain.

We rebel against surfaces and forms that don't nourish our spirit, because we feel in them a denial of our humanity. Maybe that reaction doesn't go so far as to generate hatred, but it certainly spawns a form of indifference that may be even more harmful to the community. The use of alien industrial materials is deceptively presented as necessary to support the building technology and the economic reality of today. The result is that people retain that the alien character of the built environment is inevitable, a deception that enables a large number of objects without human qualities or biological significance. This is how a visual understanding of the environment is imposed, as supposedly made up of a large number of different subjects but without ever reaching a social dimension within the space.

Conclusion

This essay raised the question of how it is possible to realize a public square rich in social life in today's cities. We explained how to construct a new square that concentrates social and urban life. Unfortunately, new squares where life reigns are no longer made because design rules coming from architects educated in "design" are applied, and those rules do not contribute to create social and urban life. 20th century architecture and urbanism were focused on often-irrelevant functions of form and style.

Nevertheless, we know that a living city-organism is a complex entity, and that it is biologists who have the best tools to help us in this task. Mechanisms apply directly to develop insight into complex urban shapes. The development of biological structure depends on both genetic coding (a predetermined program) and on the chemical markers present during development (responses in real time). Genetic coding corresponds here to the list of rules for public squares that we presented. Real-time responses instead match the determining factors in each different situation. Thus, as in the case of the developing embryo, a new square inherits the characteristics that guarantee its success in catalyzing urban life, whereas its physical expression is unique and completely individual. The life of the urban fabric is generated from the ensemble of these mechanisms capable of focusing natural and human actions.

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