

Morphogenesis and Town Perception

Claudio Saragosa, and Michela Chiti

Department of Architecture (DiDA), University of Florence, Italy

Abstract: Recognizing forms, and giving them meaning, depends on our ability to dynamically connect these forms to something jealously preserved in ourselves, in our memories: genetic memories, cultural memories, personal memories. The meaning we attribute to the things we hear is constructed in the perception of the same things we felt through our inner, and sometimes impenetrable, mnemonic identity. When this process of interpretation of feelings causes internal reactions, these reactions are called emotions. When between the self and the forms that appear in front of it, the shapes connect like mirror images, this relationship is called empathy. The aim is to understand how form (morphology) and flow (ecology) intertwine, and how these complex relationships interact with human perception, emotion and cognition. But what is the form and relationship between the shapes resulting from the co-evolution between the place and the interaction with cognitive tools and human sensitivity? What are the places of the multiple complex identities in which the dynamic dialogue between land and water unfolds?

Key words: pattern, morphogenesis, town

1. Giving Shape to the World, Giving Shape to the City of Man

For Salvatore Settis [1] there is not much difference between environmental pollution and the poor formal quality that characterizes some of the spaces: we could say that one affects the health of the body, the other the health of the mind, disturbed by such ugliness. The space in which we live in fact, for the author, provides coordinates of life, behavior and memory, builds the individual identity and the collective identity of the communities. Sometimes the space that surrounds us is so degraded that it is almost possible to think that it produces a new form of territorial anguish, a phobia that would be felt by those who, although living in their own places, would no longer recognize them, because they are devastated by concrete monsters or other radical alterations to the landscape, which destroy their familiarity. Settis proposes to use, to connote the phenomena of loss of collective image, a term coined

on the pathologies of the individual body and thus talk about dysmorphophobia of the community.

The problem of the construction of a practice that allows to contain the judgment of quality of the forms of space given by a simple evaluation on an individual basis, to bring out a more complex qualitative evaluation of the characteristics of space as a judgment on a collective basis, remains open. The Modernism (and the related machinism) had attempted to place the accent on a rational space powered by research on abstraction as the foundation of a new aesthetic. But already after the Second World War, even the modern movement was clear that, according to Richard Neutra's thought [2], the space that surrounds us is continually studded with significant diversified associations, it is never adirectional as the Euclians would like it to be; space, physiologically conceived, is never neutral: space generates emotions. With the second half of the twentieth century these concepts became the subject of many in-depth studies with the thought, among many, of Martin Heidegger, Maurice Merleau-Ponty, Gaston Bachelard, scholars who have examined the qualitative characteristics of space. It was

Corresponding author: Claudio Saragosa, Ph.D., Associate Professor; research areas/interests: urban and regional planning. E-mail: claudio.saragosa@unifi.it.

in the 1960s that Kevin Lynch [3], influenced and influencing many authors including Christian Norbert-Schulz, Kenneth Frampton, Kent Bloomer, Charles Moore, came to the definition of a more solid approach to the evaluation of urban space, what the author would call a public image of the city.

When space is generated, it needs both an ecological verification and a perceptive verification; in the latter case, it must come into contact with the deep feeling that characterizes the human psyche. The urban space, in order to give quality to the life it welcomes, can only be in tune with a sense that characterizes the way in which man himself feels spiritually satisfied. At the same time the forms of the anthropic space must not only satisfy the sensual feeling, they also have the need to resist (but also to feed themselves) to the flows of matter and energy of which the world is naturally characterized. In short, it seeks, in the management of flows, a dynamic balance with forms that, by presenting themselves to perception, can give an empathetic satisfaction. Therefore, it is never a question of a correct management of flows without taking care of the forms. Rather, it is a matter of going towards the identification of that network that connects us, as inhabitants, to the world, characterized by those forms that manage flows, in which we are immersed.

The city and the territory, therefore, are always forms that support flows and always flows that generate forms: it is this unity, this fundamental weave, that constitutes the world in which our bodies have sunk. The city and the territory exist because I am immersed and moving within them, I am swimming in their forms and flows, I am moving through an atmospheric cauldron of changing stimuli, involving or comparing multiple sensations [4].

There is a way and a way to build a project, in the sense of generating the world that is not yet manifest in front of us. A first mechanical way consists in proposing solutions that do not fit in with the ecological complexity of the world or with the perceptive capacity of men. A project that throws into

the world a form that mismanages either the flows of the environment or the forms to which man reacts emotionally in a negative way. The latter are gestural and idiosyncratic approaches that tend to tear through the fundamental weave of which the vital world is composed. A second, organic way, preserves the stratified wisdom in the attempts to manage flows and forms, in an approach based on attempts and errors with correction of the process in a perspective of co-evolution between environment and species. In this second approach, it is not so much the designer's pure creativity that counts, but rather his capacity for innovation with respect to an informative material collected in the evolutionary history of space configuration solutions. This second approach is based on a method that has been developed in recent times by various scholars in various cultural areas between Europe and the United States. All these approaches are based on the concept of information accumulated in an abstract point, defined in various ways by the terms of meme, type, pattern, spatial configuration.

2. Meme, Type, Pattern, Spatial Configuration

Richard Dawkins [5] was one of the first to think that we can build an analogy between the gene and synthetic cultural elements that allow us to collect solutions of fruitful relationships experienced in various ways over time with the environment that embraces. Genes are replicators of solutions that in the past have had a long theory of tests and corrections of errors. Genes therefore allow evolution through the differential survival of replicating entities. Like genes for genetic evolution, Dawkins thinks of memes for human culture: memes are melodies, ideas, phrases, fashions, ways to model vases or build strings. Just as genes propagate in the gene pool by jumping from body to body through sperm or egg cells, so memes propagate in the gene pool by jumping from brain to brain through a process that, broadly speaking, can be called imitation.

A concept similar to that of meme is therefore identified by a school of architecture under the direction of Saverio Muratori [6], who defines the concept of type. The case of the building type is a sort of memory of past experiences, an a priori synthesis that exists in the mind of the architect before creating, for example, a house, and is not a foreshadowing of one or a few aspects that will be assumed by the built product, but of all together: it is a real organism, that realizes the entire reality of the house before it physically exists. Cristopher Alexander [7, 8] defines something similar by accessing the concept of pattern, that is, of entity as systems of interrelated elements that combined generate the physical space that surrounds us. The author concentrates in the definition of *patterns in the world* (the physically realized space that surrounds us) and conceptual patterns (*patterns in our minds*). These last ones are not other than abstract representations of morphological rules that define the patterns that we find realized in the world. The ones are obviously different from the others. The patterns realized in the world simply exist; the others (the *patterns in our minds*) are dynamic, they have a strength, they are generative: they tell us what we have to do, they tell us how, in certain conditions, we can concretely modify the physical space that surrounds us.

More recently [9] the concept of spatial configuration to be correlated to that of configured space has been proposed. The configured space is the one that unfolds in front of us, the result of long processes of structuring that have transformed the original nature into the territory of the humans. This configured space therefore has its own identity, its own form that manages the complex ecologies that each portion of the Earth necessarily offers, giving life the possibility to develop. In the decoding of the secrets that the configured space offers us, we can identify that system of morphological principles with which life (and above all the life of humans) is able to manage the flows of matter-energy necessary to it. From the configured space we can extract those characters of the

form that, unfolded in the environment, support the organic generation of the space that surrounds us. The spatial configuration (a meme, a type, a pattern) collects the precious information given by the continuous relationship of knowledge with the fluctuating environment in which life unfolds, a knowledge that, like a gene, accumulates and sediments as a memory of the way in which over time we can find a solution to the problems of generating the space in which we are dipped.

3. Spatial Memories and Configurations: Meme, Type, Pattern

The *spatial configuration* is an accumulator of information, so it is a *memory*, and therefore we will use the word *type* in this sense. The *type*, in fact, accumulates the solutions that tried and tested are selected in the fluid process of making a configuration in relation to the context in which it is produced. The *type* learns, in the long run, to solve the problems of the spatial organization and of the management of the flows proving which decision seems to solve in the best way the coupling between the subject and the own reference environment. A process that we could define *Darwinian*, a process with tests and correction of errors, a process of selection of configurations, which seem to be the most appropriate at that time and in that place, discarding the configurations that do not solve any of the emerging problems. In the field of artistic production, this continuous process of selecting forms through the generation and re-elaboration of formal material is fundamental. It is evident how much, in that case, are necessary the processes of definition of the result through the activation of the chain feeling-perception-emotion: the formal representation is always produced with a careful process of contextualization of the simple brushstrokes subjected to continuous evaluation by the artist. In the products of the organization of space the situation is really more complex because not only is it necessary to identify a form that satisfies the chain of

feeling-perception-emotion, but also because this form must be able to manage the flows of matter-energy. This complexity therefore requires a long phase of preparation in the process of attempts and errors, so as to accumulate those *spatial configurations* that can solve perceptual problems in a space no longer as flat as a painting, a space must be used always moving within it. Any form of life works in the same way. DNA accumulates information that is capable of generating a new individual as it unfolds.

This metaphorical approach between *type* and DNA has appeared to many possible. If we consider the *type* as an entity capable of accumulating a memory able to generate new configurations, the metaphor seems even more pertinent. After all, the *archetype*, as Jung would like it to be, seems to have its own genetic origin, an instinctual way, an inner thrust, a deep drive to organize the world that derives not so much from the information accumulated by the individuality, but from that accumulated in the evolution of the species to which one belongs. A way of organizing the world that Kandel [10] would say to be *wired*, inscribed in the genetic organization of the nervous system as it has occurred in the long evolution of species by accumulating nerve bundles to other nerve bundles, memories to memories. This deep interiority is what probably gives us the sense of some things as we perceive them, because perceiving is also due to this hidden nervousness. As Maurice Merleau-Ponty said [11] it is due to tensions that, like lines of force, *cross the visual field and the system of one's own body world and that animate it with a deaf and magical life imposing here and there twists, contractions and swellings*.

Although the way we relate to the world derives largely from the individual experiences we have acquired, the experiential memories, some behaviors and the way we build a sense of the world clearly derives from our *wiring*, the way we have built over time our interface with the environment, obviously to promote survival in the tumultuous cosmos that

surrounds us. Our *wiring* depends on the way in which we have evolved over time, but our *wiring* is also the way in which we organize many factors with which we perceive and organize the world; the way in which we instinctively feel the things that surround our body. And despite the structural diversities of single individuals, these emersions from the deep appear as collectively similar ways of floating in the fluid world that surrounds us. The *archetypes* that emerge are produced by this complex management of genetic memory settled in the *collective unconscious* Jungian, in the collective feeling-perception. In the configuration of space, the *archetype* cannot be denied (and we cannot fail to do so as it is a deep part of our way of being), the *archetype* can only be discovered and managed to make the activation of the meaning processes, including perhaps beauty, even more effective.

But it's with the *types* that the problem gets even more interesting. In fact, with the *type*, the memory that is collected is that of making the solution in close confrontation with the reference environment, in seeking the configuration of the space-matter that solves the shape problems and the flow problems. The solution to an emerging problem, the solution to a problem of *coupling* an organism with its own environment can never be simply extemporary. Obviously, in this process of attempts and errors, stochastic processes play a fundamental role. We throw many arrows but only some of them hit the target. The case plays a fundamental role, but it is not only the case that guides the process: it is the throwing of the dart that hits the target and the target is the selective criterion. Perhaps the trajectory of the darts is random, but only the darts that hit the target are selected as entities that can last to give substance to the complex relationship between creature and environment. A *type* that was created to solve some spatial configurations, collects, in a memory, the thousand attempts made to solve the problem and especially collects those attempts that increase the degree of complexity of the

configuration in the management of form and flow. At each attempt mistakes are made that, corrected step by step, lead to accumulate that information system that will lead to a proper deployment of the *spatial configuration*. The *type* (*a priori synthesis, heuristic*

principle, operating gene) is the knowledge of the correct relations accumulated after the experimental path of contact between the operating creature and the surrounding world.

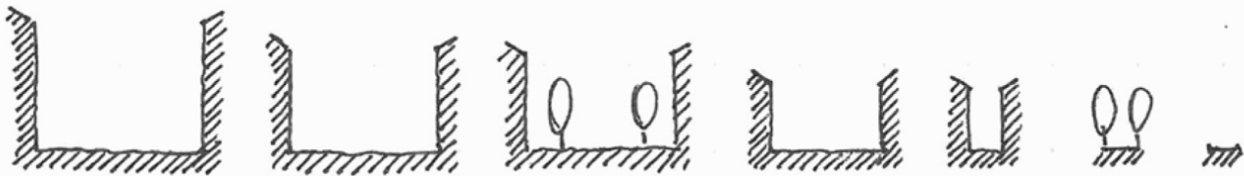


Fig. 1 The different spatial configurations of the street (from left to right the hierarchy from major street to minor street). DiDA research title: “Technical-scientific collaboration activities supporting the revision of the Urban Planning of the Municipality of Cecina, Tuscany, Italy”. Coordinator: Prof. C. Saragosa.

When we talk about the configuration of the structures of the anthropic space, although the *types* are not *archetypes*, not belonging to any construction of deep and hidden genetic origin, but being the result of processes of attempts and errors that accumulate in a labile memory, they still respond to problems of a collective order: a road must *mean* road, not for a single individual, but for all individuals in a community. Therefore, the selective process does not only select those configurations that respond to perceptual-emotional criteria (and to the ways of managing the flows) of the individual, but above all those solutions that respond to the feeling that matures within an entire community, that must recognize itself and live in that configured world. The *type* accumulates the correct solutions that are submitted to the screening of the entire community present in a place. It forms a common language capable of activating just *those* deep meanings developed and therefore understandable by *that* community.

Types are continuously updated as a *genetic pool* or a living language evolves. It is in the continuous relationship between memory stored in the *type* and comparison with the reference environment, fluid and changeable, that the information set is updated, responds to the *becoming* adapting. The *type* unfolds contextually and, in becoming matter-space, it is measured with the environmental complexity, updating itself, learning from the relationship with the flowing

surroundings to become more capable of responding to the changed world, even if only from its own presence. Bowing to the impending future, the past sedimented in the *types*, offers all its wisdom to the present, which flows in its becoming elusive world. The *type*, in short, is not a static entity, it evolves; it continuously modifies the *information* that composes it. If he comes into contact with new situations that require to be resolved, he deploys all the accumulated knowledge and in this unfolding (in this contact with the chaotic world) he learns new ways to solve problems of form and flow. The community, which uses it, evaluates its application and in evaluating it corrects any errors that emerge in its unfolding. It combines the *type* that acts at a scale level, with the *types* that act at the other levels (it combines the unfolding of the *type* of house, the *type* of building, with the unfolding of the larger scale *type*, for example the *type* of road, the urban *type*), correcting any elements of disorder that arise in the relationship of *types* to different scales. The synthesis is long; it is a long learning process that takes place over time, and this learning process is governed by the information gathered in history and continuously updated in organizing matter-space according to perceived forms that activate emotions and according to the administration of the flows that the changing environment presents at that point in the universe.

It is in this process that *information* is accumulated, rich and shared information, a memory that

accumulates in the stones (arranged according to relations distilled in the long process of selecting forms and flows); that it accumulates in extra-somatic physical memories (books, manuals, photos, paintings, etc.); which accumulates in the collective memories of the *civitas*, which inhabit the *urbs* [12] and which produce that sense of belonging to the places to which men feel close, because they know how to decode the hidden meanings in the forms and flows generated by the place itself, which accumulates in the synaptic-genetic processes of the brain when it is born in a place, and the first relationship we have with the environment produces in us the first *dispositional representations* [13] which will accompany us perpetually during the course of life; which accumulates in the brain memory, in the form of acquired functions, when our body distills information in the continuous experience of matter-space that surrounds it in its specific organization produced over time. The culture of generating matter-space (the information accumulated in memories by the deployment of types in the making of the world), influences the way of operating that will take place from that accumulation of solutions verified over time and subjected to the long process of evaluation by trial and error. You don't start again from scratch all the time, we only correct that construct which, in the face of a world which is varied even from this unfolding of accumulated information, must be organised differently; we do not start again but we implement our memory when new qualities of matter-space emerge, because they are discovered, which were not previously read in their possible usefulness. which accumulates in the brain memory, in the form of acquired functions, when our body distills information in the continuous experience of matter-space that surrounds it in its specific organization produced over time. The culture of generating matter-space (the information accumulated in memories by the deployment of types in the making of the world), influences the way of operating that will take place

from that accumulation of solutions verified over time and subjected to the long process of evaluation by trial and error. We do not start over and over again from scratch, we only correct that construct which, in the face of a world which has changed even from this unfolding of accumulated information, must be organised differently; we do not start over but we implement our memory when new qualities of matter-space emerge, because they are discovered, which were not previously read in their possible usefulness. This process of accumulation is obviously what guarantees that our information is verified (tests and errors, tests and errors, tests and errors,), but it is also what allows us to select a way (using the italic character because the ways are infinite, as in the evolution of species the possible species are infinite and perhaps those now unimaginable in the evolution of life, will soon occur) in the fluctuating complexity of the world.

Our *types* (like language, or like the genome that stores information for the deployment of life) collect and petrify the information that unfold producing the spatial solutions that organize matter-space in the world. And this system of *types* would be negative if it were a very rigid system that does not evolve with the evolution of the community in the world. A language would be only negative if it did not succeed in inventing new symbols capable of interpreting a world that necessarily evolves, if it was not capable of describing with new words the changing world of becoming, if it was not suitable for evolving in the definition of the new qualities that are discovered in the experiential study of matter-space. If life were not given by a continuous updating of the information contained in genetic memory, it would be a continuous reintroduce of an organism that, in comparison with the mutant world, would soon be suppressed. In the selection method, which is hidden in the selective process of a language and of life, there is something powerful about it. If it is true that the selection method tends to memorize and use in a rigid way the

information that is laboriously collected, it is nevertheless a method open to the future and is able to update itself continuously in relation to the changing environment to which it is *ecologically* and *empathically* coupled. If one abandoned a language or a code, it would always be necessary to re-start from the beginning losing that precious information accumulated over time, that allows us to build those bodies capable of unfolding without making obvious errors.

A *set of types* that organize matter-space works in the same way: it is powerful because it acts as a memory that has collected that information, experienced over time, that helps to solve the problems of living; it is powerful because it is open to the future by continuously updating itself according to the needs that are generated in the becoming of the fluent world. It is rigid, just as it is rigid that compendium of genetic information that allows the generation of an individual that develops according to the rules of its species; it is rigid, just like a language that being a set of shared symbols allows more individuals to have the opportunity to understand each other in the actions they want to perform in common. But it is also flexible, how flexible is a language that, by updating itself, invents symbols capable of representing new and emerging qualities; it is flexible, how flexible is an individual who, in unfolding the deep genetic rules, always intersects them with new ones, being the result of the combination of two distinct tanks.

In this process that unfolds slowly and collects solutions that are verified with the method of attempts and correction of errors, each increase in information is therefore verified information, rare, rich. Every attempt considered suitable is collected, memorized and made available to the following eventualities. In language,

signs or symbols that do not come from this long and slow process of synthesis, have labile meaning. In the biological genetic sets, the information, not subjected to this long process of screening, is even harmful, risking to tear the organic tissues resulting from the slow deployment of the information sets, sedimented in the genetic memory, linked trans-scallly to each other. Mutated genetic material produces the formation of cancerous tissues, precisely the laceration of organic unity.

There are *archetypes* that operate on the information accumulated in the way in which human beings, over time, have evolved and wired up. There are *types* that are cultural constructs given by the slow evolution of the solutions of organization of matter-space that have been screened, for form and flow, in the long period of application of a community to the solution of the problem of living in a place of the Earth. And this selection takes place through continuous experimentation, with continuous hybridization of coded material selected elsewhere, with evaluations of the continuous fluctuation of the world that welcomes us. In the relationship with the places of the Earth and in relation to the selection processes; between the diversity of matter-space and selection guided by the case of successful attempts and correct errors (stochastic processes); from the point of the cosmos where the evolutionary process is born, characterized by properties of matter-space to which we recognize some utility and on which lies already material to which we assign some value (from the forms that excite us, to the flows that feed us), just from that point comes a culture of settlement that helps man to distil those configurations that give existential meaning to the word living.

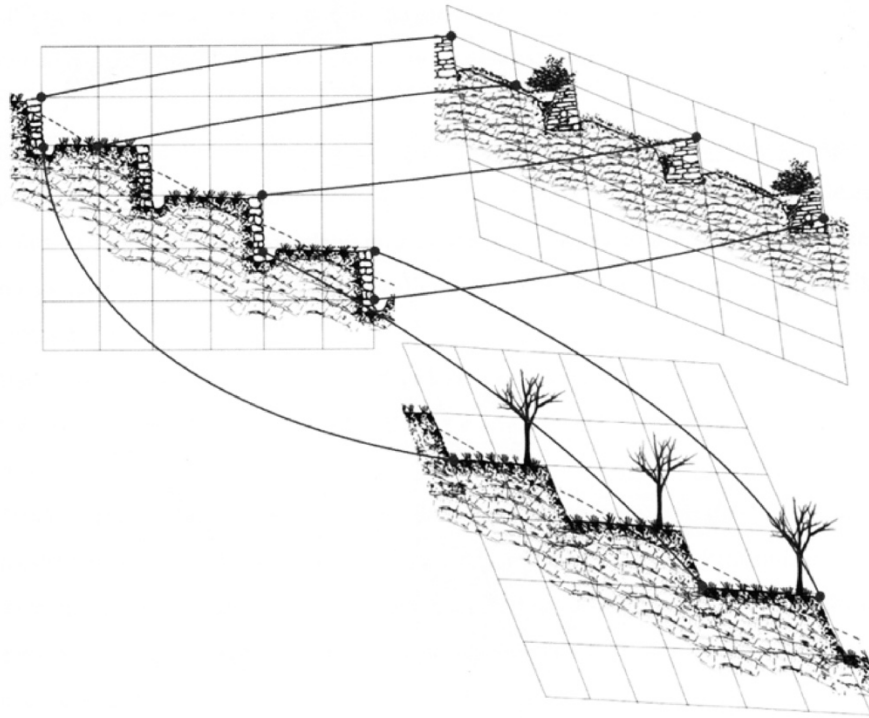


Fig. 2 The different spatial configurations in relation to the context. M. Vergamini, Territorial heritage and structural invariants. The density of the configured space and its invisible structure, Degree Thesis, 2017. Tutor: Prof. C. Saragosa.

4. Shape (Morphology) and flow (Ecology), Empathy and Entropy in the Morphogenetic Processes of Space

So, as we have repeatedly mentioned, *spatial configurations* are *types*, *memes*, that have a shape and manage a flow. The way in which they develop over time is linked to a long process of testing and correction of errors similar to what we can verify in the constitution of the genetic heritage of the various species in the world of life. While in genetics the bonds of informational structures are rigid, in *memes*, which collect the basic information for a generation of space, the bonds are much milder. While in the gene, the information is collected in a long theory of tests and errors, in the comparison of the changing environment with a system of continuous mixing of information supported by stochastic processes, in the memes the selective process is linked both to the ecological relationship with the world of flows, and to the perceptual evaluation of the species that produces the

structural changes in the geometry of physical space. This variation must be produced taking into account the relationship between perceptual capacity and shapes produced. Evidently not all forms that present themselves in front of complex evaluation systems produce the same emotional effects. There are forms of fear and forms that make us feel like we belong to a world that welcomes us and produces a sense of fulfillment. The accumulation in the *spatial configuration* (this somewhat special *meme*) of rare information capable of leading to a more correct and profitable management of the metabolic flows of the environment, and capable of producing those emotional forms that support a rich dwelling from an emotional point of view, is what gives essence to the concept of configuration itself. The configuration therefore contains selected information that guarantees a more correct coupling with the environment (in the management of the flow) and with the mind (in the definition of the emotional shapes). Information accumulates in these *memes* that help us to manage the

continuous morphogenetic process in which our existence in the world necessarily invites us to participate.

If the evaluation concerns the quality of the flows or rather the evaluation of the state variations between matter and flowing energy in the metabolic processes, then, in order to evaluate these state variations of the flows, we can approach the very complex concept of

entropy. Every organism needs, in fact, to metabolize flows of matter-energy for life optimizing the processes of entropic degradation. If another evaluation concerns the psychic processes and the spatial configuration collects the information generated in the long processes of trial and error in the evaluation of the perceptive rightness of the shapes, then we can approach the equally complex concept of empathy.

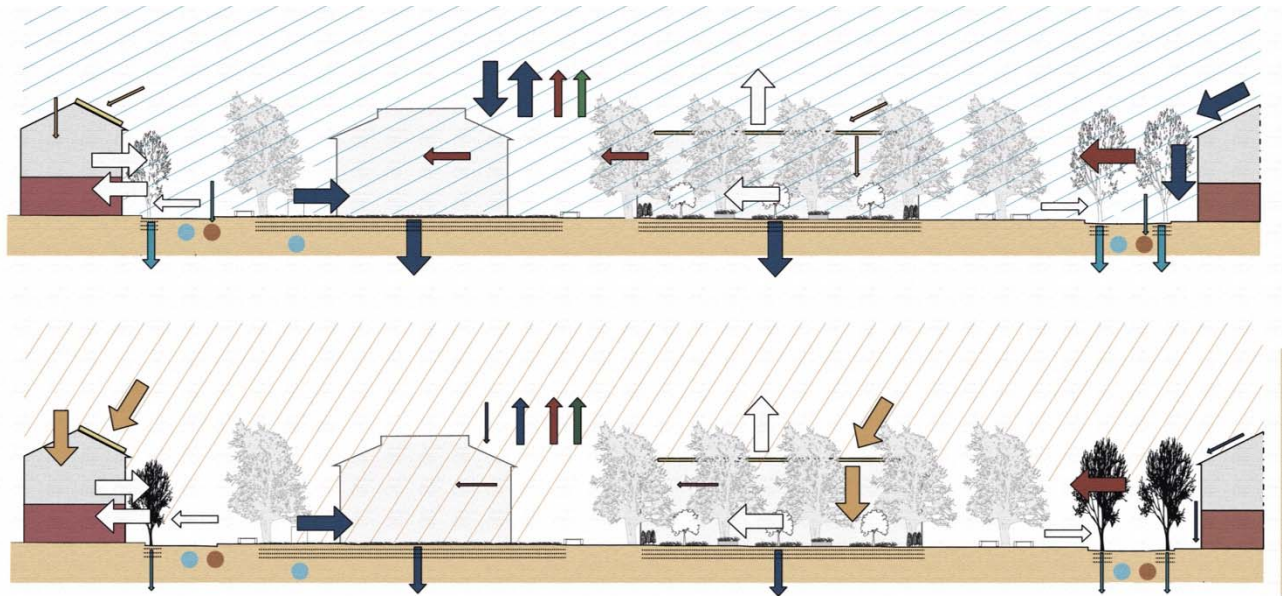


Fig. 3 The flows's management of matter and energy in the morphogenetic process of the spatial configuration of a square in summer and in winter season. M. Chiti, PhD thesis: "From growth to degrowth: theories, measures, flows and rules for the regeneration of the urban bioregion". Tutor: Prof. D. Poli. Co-tutor: Prof. C. Saragosa.

In short, the way we use to shape the space in front of us is the result of a long series of assessments of the ecological and perceptual rightness of the *meme*, which will then actually allow to operate, collect and transmit information increasingly rare because increasingly elaborate. And just as *genetic heritages* always unfold new life, from time to time updating themselves with respect to the ever-changing environment in which they operate, so does the *heritage of memes* deal with the relationship between life and the environment, with its ability to resolve, transmitting the knowledge accumulated in previous procedures of ecological and perceptual adjustment. It is a transmission, it is a making available to the future, which is about to come, the wisdom of a past in which the relationship of a changing

world has been experienced. It is a *tradition* that generates a world.

Two words, therefore, *entropy* and *empathy*, can guide us in a dynamic process in which the genesis of shapes occurs avoiding the trivial errors given by a gestural, idiosyncratic, mechanical approach. With the evaluation of the treatment of flows by shapes, through the change in the quality of matter-energy (entropic evaluations), we can find more effective ways to synchronize with the environment in which we are immersed. With the evaluation of shapes and of one's own perceptive rightness (empathic evaluations) we can identify those configurations that produce spaces capable of activating that emotion that makes the world rich at least for humanity. In fact, perceiving means

enriching the sensation we get from that world that presents itself before us with reminiscences sometimes unconsciously preserved in our memories. The meaning we give to the things we feel is constructed in perception when we wrap that thing felt by the mnemonic veils hidden in our own, and sometimes impenetrable, *I*. And when this process of dressing the sensation releases internal reactions, we call these reactions emotions. When between my *Ego* and the shapes that appear before me, these are linked as mirrored images, this link I will call empathy, a concept on which we have been working for years.

5. Conclusion

The effects of climate change are manifested before us and increasingly show the fragility of settlement systems no longer able to manage or better resist the phenomena that increasingly affect them.

The process of morphogenesis of cities and territories has sedimented spatial configurations that over time have lost on the one hand the ability to manage a dynamic balance with the metabolism of the reference environment and on the other hand the ability to activate emotions and feelings for the generation of a well-being of living in a place.

Hence the need to rethink the regeneration of settlements, of patterns that are no longer able to manage the modified flows of energy matter.

But the unfolding types are those that make them operative: but which are the good types, able to regenerate both city and territory?

The morphogenesis process of city and territory, in sustainable manner, can depend on the unfolding of a few good types, those in which shape and flow

represent an equilibrium and empathy is between shape and flow in equilibrium among themselves.

It is the study of the two that lays the basis for synthesis of shape, codifies the patterns of the morphogenetic process of both city and territory of the future.

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