Predicting the evolutive city

The notion of time in diagrammatic thinking

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Abstract: The exponential growth of built environment in the last half century presents traits typical of complex systems. At the edge of the planned city, in the so-called “transitional zones” frictions take place and trigger spontaneous self-organization processes. In order to capture those urban emergent behaviors, in the past 20 years, new design methods, based on the recognition of digital generative potentialities, have fine-tuned the development of diagrams, namely responsive systems of description and representation merging cognitive and creative steps. This approach is grounded on the observation that complex systems theory has not only changed our understanding of territorial dynamics (in both physical and non-physical senses) but has also provided operative mediums capable to fill the gap between strategic ideation and formal fabrication of ideas, therewith framing the design process in a new temporal adaptable contingency. Interestingly, such contingency respects the evolutionary becoming of urban matter, but does not constrain the architectural disciplines’ role to figure long term scenarios. In the delicate interplay of rules and randomness, diagrams are far more than technical devices and organizational optimizers. They are potential agents of radical anthropological changes.

Keywords: complex thinking in urban design; digital devices in mapping; recycling strategies in diagrammatic approach; temporal delay and artistic task of urban designers

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Preliminary considerations about the disciplinary context

The present article is an attempt to acknowledge the process of emergence that can be generated in urban design by a diagrammatic and multiscalar approach, and that can be viewed as a sustainable adaptive response to the discipline expansion across space, time and domains.

Since the early postwar years, emergence has often been object of theoretical speculation in architectural disciplines from urban planning to detail design. However, emergence has historically been interpreted mainly in structural terms. Within a general cultural context re-shaped by the large growth of complex systems theory, and by new research on morphogenesis and bottom-up behaviors, engineers such as Sergio Musmeci in Italy and Frei Otto in Germany pioneered experiments in form-finding. Concepts such as adaptability, responsiveness and resilience were introduced and a new notion of form was thus conceptualized. Inspired by research in cybernetics and by mathematical and geometrical theories of topology, and anticipating many developments eventually made possible by computer science, those experiments have represented a fundamental theoretical shift. Forms - with no exception and restriction of scale, matter and function - are now intended as provisional entities, generated by progressive emergent processes, continuously exposed to evolutionary motions.

The image of a tension between being and becoming is actually adopted by urban designers too. Indeed in 1961 Jane Jacobs publishes her masterpiece “The Death and Life of the Great American Cities” which faces organizational, rather than formal aspects of emergent behaviors in artificial yet complex organisms such as cities. Cities are categorized as problems of “organized complexity”, presenting “several dozen quantities [...] all varying simultaneously and in subtly interconnected ways” (Jacobs, 2011, p. 564). This fascinating intuition contributed to a radical theoretical shift too. Cities are no longer designed as consistent and predictable structures. Cities are no longer designed at all. The notion of form in urban design is irrevocably chased off.

This article, I pursue the ambitious goal to contribute in the building of missing bridges across architectural disciplines, from the land of complex form experimentations, inhabited by “architects of objects”, to the land of complex organizational methodologies, inhabited by “architects of cities”. A land of linguistic proliferations the first, and of strategic paradigms the latter.

1 Introduction

In complex systems, like in urban ecosystems, emergent behaviors occur when stiff and loose mechanisms of control are in balance. When this balance is maintained within the urban design process, the rigidity of a merely linguistic or ideological view is overcome. By assuming flexibility and adaptability as operative and generative strategies, yet assigning materiality and formal feature even to large infrastructural design, architects preserve their essential role to guide long-term urban transformation processes. This role in fact is nowadays doubly threatened. The global political context, on the one hand, fosters short or medium term programs as the most appropriate response to the actual permanent condition of economical and environmental emergency. On the other hand, as reaction to the modernist cultural heritage, the architectural discipline itself has progressively declined the
responsibility towards urban form legibility, preferring a model of shared and distributed responsibility facing urban planning in strategic terms only.

“Predicting the evolutive city” is thus a statement that clarifies the necessity to treat the degree of urban dynamics unpredictability with the same approach used for natural environment and other complex phenomena. The evolution of a system might be described in terms of adaptable yet geometrically determined scenarios, rather than in terms of fix and ended forms. In architectural language, this concept is expressed by the diagram of the Manhattan Grid, an open matrix that allows multiple formal interpretations. In his book *Delirious New York*, Rem Koolhaas (1978) has deeply reasoned on metropolis survival ingredients. According to his theory, what mostly guarantees urban vitality over time is the delicate interplay of rules and randomness at all scales, at the architectural level as well. Such approach, also driven by the American socio-economical model and political beliefs, has produced a flexible and differentiated system, capable to absorb sudden changes, and follow spontaneous trends smoothly. The Manhattan Grid functions as a diagram, a generative tool that accumulates information across scales while engendering creative manipulations, and unexpected programmatic and formal results.

In the next pages the diagrammatic thinking, with its phenomenological, evolutive and strategic methodologies, and with its simultaneous systemic and local vision, will be illustrated. It will be argued that diagrams are not simply a design technique, challenging the digital generative potentialities. Diagrams are *thinking machines* that translate the complexity of the design process into abstract systems of description, from which strategic policies, resilient to temporal and functional changes, can merge with formally defined responses. As Bruno Latour says “A tool it is never a ‘mere’ tool. [...] It always modifies the goal we have in mind” (Latour, 2005, p. 153). Diagrams share a philosophical and political background – what has been called a “mental habit” -, with consolidated roots and multiple interpretative paths, within and beyond architectural disciplines.

Among many other aspects, the article will focus on two topics related to diagrammatic approach. The first is the notion of *material recycling* coming from mapping procedures which recognize and breed emergent behaviors out of innovative assemblages rather than invention of new material. The second is the notion of *temporal delay* as a precondition to establish intuitive and empathic relationships with the complex material we encounter in urban investigations, and eventually as an essential device capable to anticipate individual and anthropological drifts.

These two aspects in certain ways measure the sustainability degree of diagrammatic approach.

2 “Demoniac” scalar shifts

In his book *Future*, the anthropologist Marc Augé (2012) remarkably explains the ultimate scalar shift of globalization and its paradoxes. Globalization involves economy, technology, politics, ecology, and also aesthetics and culture. Domestic and urban spaces universally share the same fate. We believe that in the open, flexible, hyper-performative environments we conquer freedom and customization power, but in fact we loose specific quality and dismiss any sense of belonging.

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1 Marco Revelli defines in this way the new forms of power in Revelli, M. (2012). I demoni del potere. Bari: Laterza
This process of estrangement grows beside the stirring illusion that nowadays we are able to physically access and virtually travel across a planet where boundaries have apparently disappeared. Satellite imaging, i.e. Google Map, by feeding our genius itineris while comfortably sitting in front of our computer screen, provides an emblematic example. In a tiny temporal span, we got used to this new perspective where the Earth can be magically visualized as a non-differentiated globe, shrouded in a moving mist, but also as a granulated, diversified, neat land.

However, as Augé argues, in this accelerated-media culture, behind the celebration of diversity, participation, and interdisciplinarity the deconstruction of many physical, political, cultural frames has gradually produced other, more invisible, forms of partition. Consistently with his theory, the contemporary manipulation of space follows a kind of “military” logic. Depicting a permanent condition of emergency, and generating a real condition of vulnerability, we are both legitimizing and participating to new and perhaps more perverse space colonization typologies. The new “colonizers” – abstract entities like market, rating agencies, etc… - are conquering our space by depriving us of the dimension of Time. We are more and more steered by the notion of quantitative time, obsessed by the idea that shortening distances and challenging human speed – through physical infrastructures and invisible networks - has an intrinsic value. But meanwhile the empathic relationship with our internal desires is lost.

The philosopher Giorgio Agamben illustrates a similar theoretical position describing post-industrial public spaces as “immense prisons”, overwhelmed by technological devices (e.g. the mobile phone). Such “apparatuses” function as mediums capable “to capture, orient, determine, intercept, model, control, or secure the gestures, behaviors, opinions, or discourses of living beings” (Agamben, 2009, p.14). In relation to space, they are generating massive, yet hidden processes of estrangement consisting in removing common, accessible space and transferring it into separate spheres. Similar practices have historically generated archaic sacred spaces, whose transformation implied their exit from free use and trade among humans. Against such “cultural hegemony” we need to create “counter-apparatuses” (Agamben, 2009, p.19) capable to neutralize the current threat of physical borders and temporal contingency. Without giving an exact definition of counter-apparatus, Agamben insists in its relation to time conception. A public space sense of belonging could be surprisingly restored through resilient behaviors, opposing time roaming to blind adaptability, as if in the limbo of a bewitched stillness the formula for space liberation processes could be found.

What has been shortly acknowledge through the words of Augé and Agamben is that life sciences - and among them architectural disciplines - are facing an epochal shift in which technological, spatial and temporal components are strongly interrelated and re-defining the notion of estrangement or belonging. Accordingly, it will be further argued that, although technological devices are essential relational and generative mediums in diagrammatic approach, its methodology is based on labor-intensive explorations. In its “temporal delay”, the long morphogenetic process - meant as a circular trajectory where form fixation is postponed and the unfolding of general purposes is expanded - functions as a counter-apparatus in that it allows a deep listening of internal desires.

Before investigating the temporal dimension within the diagrammatic approach, however, some more explanations on the way the mentioned scalar shift has affected architectural practices should be given.
3 New paradigms and recycling strategies

In the globalised world, the traditional notion of scale as used by architects to identify their disciplinary category becomes obsolete if not hazardous. Nowadays “space manufacturers” are committing with a scale that goes beyond simple imagination. The intricate system of networks crossing the planet, many of which invisible, is redefining the operative framework, not only in physical but also in theoretical terms. Thus, it is crucial to think both strategically and materially, at small and large scales, and to consider global reverberations of local urban actions and policies.

The post-Kyoto metropolis has clearly changed the paradigms of architectural disciplines. We have to face all together the radical mutation on lifestyles, the social, religious and ethnic métissage, the political and economical instability and, of course, the alarming environmental decay. Before facing these challenges with focused programs and specific urban forms, a credible project must identify the most critical issues and the most urgent necessities. Although the expanded geography is allowing amazing knowledge and skills exchange, the awareness of Earth limited resources is increasingly leading to local recycling strategies. The exponential technological development takes part to this cultural shift in that it supplies instrumental devices capable to catch local emergent behaviors from which suitable yet original strategies can be originated.

More and more, urban designers today embrace the idea that the “uniqueness” of their design solution does not rely on the invention of new, sophisticated material but rather on smart recycling, innovative assemblages, and re-use of existing available resources.

Figure 1: Images of the city in the 60’s and 70’s as assemblage of diversities. Left: Rem Koolhaas “The City of the Captive Globe Project” (1975); Right: Archigram “Instant City” (1961)

In fact, already post-modernist architects achieved the consciousness that, in order to trigger states of provisional organizational urban control, the project should “capture” the emergent behavior of existing structures and unfold them into creative experiments of collage. Deliberately grasping, overlapping, manipulating, reorganizing, and redefining semantic meaning to pieces deriving from the coarse material of the unplanned city became since the Sixties the major compositional technique for many architects, and for artists and musicians as well2 (Figure 1).

As known, most of the time these techniques were used to manifest the idea of chaos and lack of control and predictability, rather than for their rigorous methodology, simultaneously analyzing and creating emergence. In other words, complex systems theory was and still is mainly treated in a non-technical sense, more as a metaphoric cultural substratum.

2 Interesting on this regard the exhibition “The Small Utopia Ars Multiplicata” (Ca’ Corner, Venice 2012)
4 Cultural roots in urban complex thinking

When in 1956 Jane Jacobs published her article *Downtown is for People* in which she laid out the limit and the arrogance of the modernist ideology in the postwar New York planning, she might not have imagined that a deep theoretical reformulation would take place in urban theory, mainly regarding the methodological approach and the complex thinking application.

Against the model based both on the replication of universal strategies - generating undifferentiated and mono-functional districts - and on the sterile repetition of “intelligent” architectural typologies - producing social and cultural conflicts more than integrated communities - she defended the complexity of the urban ecosystem, and its analogy to natural ecosystem. Both are fragile and vulnerable, also resilient at the same time. Both require much diversity to sustain themselves. In both “many small and obscure components – easily overlooked by superficial observation – can be vital to the whole, far out of proportion to their own tininess of scale or aggregate quantities.” (Jacobs, 2011, p. XXVI)

Increasingly, in the following decades, urban thinkers learned to overcome the ideological and deterministic view, typical of the early bourgeois society, and to face the new urban phenomenology not as a consistent entity and an only-physical artifact, but rather as a complex organism whose survival depends on the capacity to let vital and creative components emerge, and to maintain their diversity over time. The postwar fast growth of the built environment seems to suggest that, at the edge of the planned city, in the peripheral, instable and transitional zones, where rational control is weaker, novel social and economical structures are smartly self-organizing.

Members of Team 10 first, and later urban thinkers such as Colin Rowe, Robert Venturi, Christopher Alexander and others, in different ways, turned their interest to the spontaneous, heterogeneous urban morphologies, as expression of informal yet emergent behaviors. Gradually, the anxiety to invent new futuristic urban typologies was replaced by original and sometimes provocative urban taxonomies made by the reinterpretation of existing material. The shift affected both the linguistic apparatus and the procedural strategy.

Exploration of new descriptive and generative techniques operated by post-modernist architects raised a fertile methodological debate and new theoretical disputes. As soon as new digital devices started to be adopted, the interest in complex systems theory followed two divergent paths. On a one hand “architect of objects” neglect any engagement with larger environmental impact, on the other hand “architects of cities” deny and mortify any systemic formal control. A land of linguistic proliferations the first, and of strategic paradigms the latter.

Meanwhile, the new democratic and participatory society is unequivocally demanding for new operative models where the distance between city planners and city users is shortened. The collective demonization towards the notion of form in relation to city planning is indeed a consequence of the severe critique of urban thinkers as Jane Jacobs. Perceived as synonymous of top-down and authoritarian impositions, the formal approach is thus increasingly abandoned. Beyond the single architectural organization, the primacy of highly strategic thinking is settled. In such cultural drill, Koolhaas few years later develops his urban theory grounded on the concept of “programmatic instability” as aesthetic category.

3 Jaap Bakema, Georges Candilis, Giancarlo De Carlo, Aldo van Eyck, Alison and Peter Smithson and Shadrach Woods
Nevertheless, the two opposites approaches – the formal and the strategic - have the common belief that, in order to describe and generate diversities in multilayered, complex urban fields, it is worthwhile to use techniques that are able to capture emergent behaviors and to integrate the notion of time. In this respect, the assumption of the evolutionary model in architectural practices represents a fundamental step.

5 Temporal dimensional and mapping

Time is an essential variable in the architectural project.

According to Bruno Zevi, a history of human artifacts with the intimate ambition to release space from its static nature could be traced. By opposition to architecture inspired by Hellenic thought, based on rigid compositional rules, “temporalized architecture” obeys the unique law of mutation. Examples of this architecture include gothic cathedrals and medieval towns, which are “organic, alive, modulated by the needs of users, capable to expand; free from any formalistic taboo as well as symmetry, alignment, and perspective’s rules” (Zevi, 1993, p.29).

Beside this interpretation of time as an aesthetic category, however, there is a specific moment wherein the urban theory, and in general human sciences, adopt an evolutive thinking. In the second half of the XX Century, the conceptual model of the complex system theory provides methodological and technical tools for conceptualizing and simulating the genesis of complex organisms and their temporal mutations. As anticipated, in architectural practices this model was adopted both from architects of objects and architects of cities, but the role given to digital devices was slightly different. Although most architects of cities interpreted softwares as relational medium capable to facilitate complexity communication and representation, a field of research – here defined diagrammatic thinking - started to investigate on vectorial softwares generative potentialities. The generative paradigm, affirming that any description technique establishes a continuity-simultaneity between cognitive analytical moments and synthetic creative moments, may eventually reduce the gap between idea and form fabrication in the design process.

Such position is still largely misunderstood by many “pre-digital architects”, and not only. Skepticism typically arises as soon as the word “technique” appears. To elaborate on this critical point, it can be helpful to explain why what allegedly is a description technique does not merely describe, but instead is a selective and projective operation as well. Mapping represents a good example (Figure 2).
Figure 2: Mapping and Design Process. Caterina Padoa Schioppa: sequence of diagrams of pedestrian flows and activities that inform the emergence of a new configuration for Piazza della Repubblica in Rome (2007)

“The map is not the territory” Bateson says, quoting the famous Korzynski’s sentence. “What gets onto the map is not the territory. [...] What gets into the map, in fact, is difference” (Bateson, 2000, pp. 455-459). And difference, Bateson continues, is a very peculiar and obscure concept. In its most elementary sense, difference is synonymous of “idea”. Hence, mapping is about creating a non-representational body that accumulates knowledge and meanwhile unfolds potentials. Mapping is about transferring from past learning and assigning meanings to the living environment through a system of signs. Mapping can be considered the most archaic form of relationship that humankind has established with the surrounding world. Since the Neolithic nomadic life, the primary action of the Menhir elevation has been a relational and physical form of writing, triggered by the impulse to measure and constrain the boundless space of chaos with objects, attributing a specific meaning to a place, rather than constructing a space.

This practice of overlaying system of traces to the obscure and chaotic territorial dynamics has always been conditioned by the available medium, which reflects behaviors and beliefs as well as scientific discoveries of a society. Today digital technologies are the available medium through which territories are explored and fabricated at the same time. They facilitate creative geometrical manipulations, and proliferation of visualizations. They enable to manage vast assemblies of heterogeneities, elements referring to broader entities that are leaving traces that we do not necessary comprehend. However, as Bateson points, in this multiplicity of procedures there is not a conventional method of describing the complex layering of the territory. There is just the consciousness that ideas, information, steps of logical or pragmatic consistency, and the like do not fit together through the classical procedure of linear chains.
In conclusion, Bateson affirms that “what should be investigated and described is a vast network or matrix of interlocking message material and abstract tautologies, premises, and exemplifications”. A world dominated by “circular trains of causation” (Bateson, 2002, p.15).

Let’s clarify how this approach is related to – or is even a way of describing - diagrammatic thinking.

6 Multilayered interconnected structures

Indeed, as Christopher Alexander (1988) manifests, “the city is not a tree”.

Urban structures behave as multilayered systems, which can be conceptualized as expanding, infinitive, tridimensional networks – or what we call diagrams - describing the complex system of relationships, beyond physical boundaries. Hence, networks are not to be intended as stable objects whose form is what we broadly associate to a system of interconnected points. Networks here refer to a technique of description that allows what Bruno Latour calls “translation”. “Like Michel Serres, I use translation to mean displacement, drift, invention, mediation, the creation of a link that did not exist before” (Latour, 1994, pp. 32-38). Techniques, he argues, “modify the matter of our expression, not only its form. […] Techniques have meaning via a special type of articulation that crosses the commonsense boundary between signs and things” (Latour, 1994, pp. 32-38).

Thus, the “network method” denies the construction of an a-priori framework, and follows instead a Goethean methodology in which description replaces explanation. In this manner, the “scientific procedure” consists of the selection and disclosure of phenomenological relationships from a context, before revealing the principle of causality. Explanations are rather originating from a unique discourse, during which “objectivity and subjectivity are not opposed; they grow together, and they grow irreversibly together” (Latour, 1994, p.64).

In the past thirty years, in territorial mapping similar methods were explored by landscapers. Facing the evolving, fluid and unpredictable matter of the natural realm, they have always engaged with the ambiguous relationship between the fixity of a drawing and the dynamism of the living world. Their capacity to think in evolutive and strategic terms, and to fine-tune virtual mapping techniques is one of the main reason why landscape has increasingly become the “lens” (Waldheim, 2006) through which contemporary built environment is examined. The segregation in single entities that eventually overlap provides a way to describe extensive and complex information in a single frame and, at the same time, to visualize and conceptualize the investigated objects in terms of interconnected variables.

The diagrammatic approach, as it will be argued in the next pages, follows that same methodology. By converting qualitative states into quantitative variables, diagrams might register all dynamics, physical and non-physical – cultural, economical, social and political as well - as measurable and shaped entities. In this way, they truly overlap. Within this systematic procedure the emergence of a virtual reality, where circular trajectories and “translations” are constantly occurring, is enabled. Latour’s concept of “translation” encompasses the idea that the form of our description – that is, the form of the network, or the diagram - is the consequence of a tension between being and becoming.

At this point, many questions might arise. How should be represented the “magmatic”, hybrid condition in which the distinction between “human and nonhuman” entities - as Latour (1994) calls them - is progressively blurring? How forms that are in the state of becoming
should be displayed? How the evolutive tension between being and becoming can be bred in a morphogenetic urban process?

To elaborate on this critical point, it is important to discuss two issues related to complex system theory in detail: the notion of scalar differentiation as a means to measure “degree of virtuality”, and the notion of form as provisional and evolutive state (Figure 3).

![Figure 3: Evolutive forms. Left: Desert Dunes; Right: Maurits C. Escher: Sky and Water I (1938)](image)

7 Multiscalarity and evolutive forms

Like any other living structure that inhabits our planet, the architectural project embodies multiple temporal-spatial scales. In architecture, the concept of scale is conventionally related to a codification system that establishes dimensional references. This set up, as long as the production of drawings was made by hands, has always been an a-priori condition. Digital drawings are made at scale of 1:1 and the dimensional reference in fact can be decided at last. The notion of scale is expressed by other procedures, i.e. by the number of entities (layers or strata) that can be turned on and off. In the random digital trajectories, similar to Google Maps trajectories, however, we got used to understand “scalarity as a degree of virtuality” (Padoa Schioppa, 2010). In other words, within a complex system, scale is conceptualized as a way to restrict or increase the number of observed and described relationships.

Complex systems are characterized by the invariance of their phenomenology across scales, from cosmic to subatomic. Genes, molecules, tissues, organs, organisms as well as families, social groups, micro settlements and macro populations, reveal a substantial formal and structural internal coherence moving from one scale to the other. Components with a certain degree of internal complexity and self-sufficient behavior increase the creative potential of the whole system by implementing their capacity to interact, yet, keep their individual features.

Translating this rule to the architectural project, the degree of virtuality can be identify in relation to its temporal-spatial location in the following way: more ambiguous and abstract states correspond to larger contexts of generic and instable matter; conversely, functional and structural specific prescriptions belong to the actual ended form. In fact, the two - virtual and actual - extreme states are not sequences of a linear temporal chain, but simultaneous conditions, constantly overlapping and informing each other, in a dynamic agenda of
reorganization, reciprocal adaptation and metamorphosis. This notion of multiscalality – the coexistence and the co-dependence of multiple set of relationships within a single body – consolidates the idea that in urban processes any form – also beyond physicality - can be intended as a more or less provisional state, depending on the partial observation point and the contingent temporal setting.

Manuel De Landa explains the idea of evolutive form introducing the concept of material system, that does not make categorical distinction between substance and form, organic and inorganic, finished and unfinished, internal and external body. A material system is a stratified complex aggregate without clear demarcation, and linear behavior, in which function and form overlap, and different states coexist, much as water’s solid, liquid, and gas phases may coexist. All phenomena – geological, biological, social, and linguistic constructions – are “complex mixtures” that can be described with the same category, i.e. the degree of material acceleration-coagulation–sedimentation, “shaped and hardened by history” (De Landa, 2000, pp. 25-26). Behind the “structure-generating processes” of any of these structures, there are engineering diagrams – or “abstract machines” as Deleuze and Guattari (Deleuze & Guattari, 1981) define them – that can be discovered through a bottom-up methodology.

In operative terms, this concept has a great impact. “De-stratify reality itself”, beyond the traditional scalar demarcation, allows to search for complex aggregate of internal consistency. Material systems inhabiting the world, indeed, always leave more or less evident traces. The crucial point deriving from De Landa conception is that in any context - even the most remote, synthetic, and disturbed one - it might be possible to recognize a material system showing emergent behaviors. Through a process of mutual discovery - i.e. of emergence -, such material can be used, exaggerated, manipulated and transformed into higher organizational level.

After all, this approach refines in another way post-modernist recycling strategies.

8 Self-organized models and intuition

In urban investigations, as well as in life sciences, one of the most critical aspects in embracing complex systems theory has been and still is related to the integration of the notion of adaptability, flexibility, responsiveness of instrumental tools used to trigger “trial and error” procedures and self-learning mechanisms. In many ways, the ecological model – e.g. adopted by structural architects and landscapers – might be considered the most accurate and operative framework, as it grasps the evolutionary and unpredictable character of the living environment, and tolerates local adjustments due to technological, scientific, social and political changes.

Observing the natural realm, in spontaneous formation processes and self-organized structures, we mostly find objects that cannot be explained by knowledge of physics, chemistry or biology alone. Large-scale weather systems like vortices caused by spinning masses of air; concentrated path systems for electrical energy caused by lightning; travelling dunes ribbed by the wind; pebbles rounded by running water; animal technologies - e.g. termite cities, spiders’ webs, wasps’ nests - or the most primitive technical objects invented by man - e.g. nomads’ tents, suspended bridges, woven reed huts and clay domes - are all coagulates of matter with emergent behavior. By adapting to local conditions, by tolerating structural and functional deformability, by both exploiting and returning resources to the
environment, and by saving energy and material, these systems are models of an *integrated intelligence*\(^4\) representing the unity of beauty and best performance.

Heeding these models seems to be the most intuitive approach of learning about morphogenetic and nonlinear dynamics. On this regard, since the late Sixties, among other contemporary experimental engineering researches, Frei Otto explored several methods of simulation, whether replicating literal forms or reproducing systems of relationships, always understanding the genesis of an ended complex form as a synthesis of reiterative and intertwined steps in which the material responsiveness allows for unpredictable results to occur.

In his research he demonstrated that, investigating a construction principle without being constrained by rigid purposes and deterministic formal control, the “intrinsic material creativity” could be activated. Before assigning scale and function, material manipulation allows the so-called “structural intuition”\(^5\) to perform, irrational aspects to emerge and eventually the unity of beauty and best performance to be generated (Figure 4). Not surprisingly, in this kind of experiments the figurative resemblance to and reminiscence of natural formations has an intentional vigor. Ciro Najle describes such vigor as a “nonlinear ethics” that “naturally carries to a formal complexity” (Najle, 2010).

Frei Otto experimental attitude has an essential impact in what in this article is presented as the diagrammatic approach. Following the same methodological principle, so to say a bottom-up approach not driven by intentions but rather by intuitions, we might start investigating the existence of material systems, and later their intrinsic creativity.

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process is always driven by initial intuitions and by the selection of a specific geometrical framework that will undoubtedly anticipate organizational and formal configurations. A slope for example can be represented with contour lines, or Voronoi tessellations, or plane colored gradient. Depending on the initial decisions, taken more or less consciously, the process of “destratification” and fabrication of a virtual territory will change. Hence, diagrams are intended as generative tools rather than modes of representation. In this sense, the relation between diagrams and forms is neither linear nor accidental.

Deleuze and Guattari define diagrams what “does not function to represent anything real, but constructs a real that is yet to come, a new type of reality” (Deleuze & Guattari, 1980, pp. 177-182). The aim of diagrams, like the network method of Latour, is not to search for explanations. As anticipated, diagrams are “thinking machines” operating by “circulation of movement, with alternatives, jumps, and mutations” (Deleuze & Guattari, 1980, pp. 177-182), and gradually generating virtual, dense and ramified territories. In such projective and transferable artwork, indeed, multiple and diverse manipulations take place. Geometrical, topological, and scalar manipulations, together with the interaction and negotiation with other diagrammatic species deriving from different material system investigations, create constant and incisive interferences in the long productive chain between ideation and fabrication of ideas.

Within a determined geometrical agenda, the labor-intensive diagrammatic process traces a circulatory itinerary in that it bounds at the edge of rigorous data registration and visual intuitions. Unlike parametric design which, relying on advanced computational softwares and digital animations, develops forms from scripting techniques, manual diagrammatic procedures enable a continuous visualization of the findings. Such visualization, indeed, triggers intuitive maneuvers and therewith facilitates the progressive assembly of material systems.

It seems that, as observers, only by adopting an emergent behavior we might learn from emergent behavior of material systems, and discover their internal creativity. In other words, the design process itself can be considered as the outcome of steering manipulations and temporal adjustments engendering provisional conditions of equilibrium, whose aim is to make room for the emergence of new virtualities, out of tension between control and freedom, rigor and error.

Ciro Najle explains the nature of this “mental habit” in this way: “the proliferation pattern is not only used as a means of geometric control, but also as a seed to paradoxically lose control through the same means that provides control, thus engendering a consistent mechanism of expression and nonlinear behavior” (Najle, 2010).

Beyond the generative potentialities, the abstraction of diagrams is also an essential relational medium in a sense that it facilitates multiple interpretations and drives decisions smoothly. Such “illegibility” (Barthes, 1999) unfolds all the imaginative contents in the material sedimentation process, and delays the definition of objects.

In light of this argument, diagrams might be considered beneficial counter-apparatuses, enabling a selective yet expandable system to acquire definition progressively.

10 Cities and Dreams

If diagrammatic approach can be intended rather a mental habit than a technique, some questions might arise. Why should this counter-apparatus affect our general purposes and help in our practical achievement? How could it be meaningful during the unfolding of our desires?
As Italo Calvino says, “Cities are just like dreams: everything imaginable can be dreamed, but even the most unexpected dream is a rebus that conceals a desire or its reverse, a fear. Cities, like dreams, are made of desires and fears, even if the thread of their discourse is secret, their rules are absurd, their perspectives are deceitful and everything conceals something else. […] Cities are also believed to be the result of the mind or chance, but neither the one nor the other suffices to hold their walls” (Calvino, 2002, p.44).

Perhaps, by keeping the virtual and actual plane active, the diagrammatic approach might capture the sense of this rebus. In what Deleuze and Guattari call the “privileged intermediate space between art and science” (Deleuze & Guattari, 1991, pp. 189-196) internal desires are disclosed through a continuous negotiation between enigmatic infinity of artistic creation and terrific delay of scientific methods. Paradoxically, in the labor-intensive diagrammatic process, we learn to preserve energy and to generate sustainable behaviors.

In other words, we begin to crystallize the essential and to assign permanent meaning only to what is most relevant. At the same time, we come to tolerate, both metaphorically and practically, certain degree of looseness in the flow of architectural becoming.

Overall, in this temporal delay we drag ourselves through unknown territories while expanding our knowledge, but also loosing the attachment to reality. In a sort of blind journey we fulfill our “artistic task” by illuminating things that are in the shadow, making invisible-objects visible, turning neglected and banal into functional and seductive. Agamben would say that such anachronistic attitude corresponds to the notion of “contemporariness” (Agamben, 2006, p.41), the power to build bridges between the present and future. Archaic expectations and sluggish behaviors - within entropic environment - are indeed essential components of dreamers and border’s pioneers, people that have properly combine time roaming and the conquest of space.
References


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