The hidden geometry of MUSAC. Field systems as the origin of form in the contemporary project

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Multiple territories: from narrative to process

With number 218 begins the tenth and last series of CIRCO, titled "Los límites de lo urbano". An essay published in 2016 under the title "MUSAC, seis pasajes", written jointly by Luis Moreno Mansilla and Emilio Tuñón and signed by them in 2010, a reminder that it was published in the first issue of the journal *Cuadernos de Proyectos Arquitectónicos*[2]. The text is a reflection, written a decade later, on the methodological process of one of the most important built projects of their career, the Museum of Contemporary Art of Castilla y León (MUSAC), winner of the Mies van der Rohe award in 2007. The article is structured in three parts: "life as transformation", "transformation as a project technique", and "the unexpected as recognition of life". It runs through a diagram-map[3] of six research territories, with discontinuous limits, around three concentric circles (selection, transformation, and project). Each territory starts up paths of exploration, crossing the concentric circles, using selected concepts and transformation tools. The existence of these approaches – the personal, the intellectual, the geometric and material, the historical, the artistic and social, and the natural[4] – makes it possible to address the process of project creation from a methodology and variables other than the assumptions of modernity (function, context, technique). The article runs through the threads that weave the narrative, built by the architects to justify the project, transcending the concrete reality of the museum itself, to delve into theoretical and technical reflections on the origin of the architectural form, using critical analysis of the MUSAC's visible geometry and comparing it with a selection of relatable past, present and future projects, in an effort to reveal a hidden realhypothetical real process[5].

The personal: from mat-building to expressive systems

Richard Rorty is commonly known among architects for his statement that the success of a project lies in the spontaneous encounter

between private obsessions and public needs[6]. Private obsessions, or particular concerns, are part of the territory of 'the personal'. The concepts of "equality and diversity", selected in the first territory, have been present since the beginning of Mansilla+Tuñón's work and are evident in each of their projects. They are also a possible seed of their democratic principles, born early on in their career. Debates begun in the 1960s were resumed in the 1990s, such as the one in American music between Milton Babbitt's repetition and serialization on one hand, and John Cage's[7] randomness on the other; combinatorial strategies in architecture which were harshly criticized in the 1970s and 1980s were redicussed[8], such as the concept of "city-building" or "carpet building". Issue 54 of Circo fanzine published a text by Juan Coll, titled "Mat-building", which began by defining the term 'mat'[9], recalling the concept of "mat-building" as published by Alison and Peter Smithson in "How to recognize and read mat-building".

Open debates from the 1960s were resumed in the 1990s, such as the one that existed in American music between Milton Babbitt's repetition and serialization and John Cage's randomness; harshly criticized in the 70s and 80s combinatorial strategies were recovered in architecture, such as the concept of "city-building", or "carpet building", published in issue 54 of Circo fanzine. A text by Juan Coll titled "Mat-building", which began with the definition of the term 'mat', and recalled the concept of "mat-building", published by Alison and Peter Smithson in "How to recognize and read mat-building".

Their interest in history enabled them to travel in time and space, finding answers[10] in more distant references which were perhaps already known by the authors of the mat-building, such as: the City of Persepolis (Shirán , 521 BC), which uses replication of elements and scaling based on function; or the Diocletian Palace (Spalato, III-IV century AD), built as a single piece on which a medieval city was superimposed, and which takes its shape from the adjustments to its structure and limits. Others cities taken as examples were the City of Fatehpur Sikri (west of Agra, 1571-1585), built in one stroke within the same geometric logic, adapted to different interconnected programs; and the Katsura Imperial Retreat Palace (Nishikyo-ku, 1962), where a repetitive element, the tatami, generates the geometries and relationships between the parts. The common concepts found, of an open and flexible system capable of adapting to any form, program, or place, enabled them to respond to the contingencies of reality.

From the beginning, the MUSAC project went through changes of location and spatial program [Fig. 03], going from a 1000m2 plot behind the Auditorium of León to an 18000m2 one on the edge of the city, and from a permanent program and universally accepted function, with the idea of being a contemporary archive, to a temporary program – in constant movement – and open function. These changes meant alterations in the project's form, turning a four-storey tower into a one-storey carpet-building. It was then that Mansilla and Tuñón decided on a system of repeated elements or equal geometries, interconnected under local rules, and with horizontal growth, conceived from the angle of the floor plan, allowing the concept of city-building to be linked to the MUSAC project. The mat-building evolves to a more expressive system through the breakdown of the floor plan's orthogonal form, and some freedom in its section. The personal territory is proposed as a transition from "equality and diversity" to "expressive systems", is an evolution between the two lines of research, which covers the concepts of "repetition and randomness", where freedom is linked to randomness, the concepts of "restriction and potentiality", "system and subjectivity", where the system is expressed by the freedom of its subjectivity. However, MUSAC's system fails to enhance the expressiveness granted by the freedom of its section, only applied on the extrusion of some of its modules, converted into skylights.

The intellectual: from oscillation processes to series and families

Since Eisenman declared the exhaustion of architecture as a reference of itself, the limits of architectural theory and practice were expanded, Rossi affirmed that the context took on a new character as an individual and collective memory of events and places of an analogous city, Venturi valued new concepts such as complexity and contradiction, or Koolhaas demonstrated the independence of form versus function[11]; contemporary or "transmodern[12]" architecture, began to integrate concepts, techniques and methods foreign to architecture to define the form of objects. In 2002, in the middle of the MUSAC design process (2001-2004), and also in the middle of Mansilla and Tuñón's trajectory as an architectural practice, Mansilla and Tuñón published number 96 of the fourth series of Circo, "En el corazón del tiempo", an essay titled "Arranque y oscilación. Embudos y duchas", which reflects on the concepts of "starter concepts" and "oscillation procedures"[13]. The authors affirmed that while the positivist identification procedure is a unidirectional, patterned and disciplinary linear procedure, which starts from the existence of a single, analyzable and measurable reality, interpreted as an idea by the architec, in order to reconcile concepts and forms in the modern project, the oscillation procedure reverses the order between reality, subject and object, accepting the existence of multiple complex realities, where the idea, coming from the architect's private obsessions, is confronted with public needs to specify the form of the contemporary project.

Mansilla and Tuñón stated that every project starts and moves forward, taking an idea and turning it into a thing, a model, and from that model, generating new ideas, repeating it successively. The oscillation process is an intellectual process of comings and goings, where the ideas proposed at the beginning must approach an unforeseen reality. It is in this testing process that the dialectic becomes a mediator, a critical mechanism of exchange and reconciliation between ideas and needs. The same idea can take different forms, as long as the idea has a certain degree of freedom, of openness, of movement. When the idea is closed and uncommon, the form is also closed, even though the idea must be and is independent of the form. An initial, abstract and generic form becomes specialized and concretized in a final, specific and particular form, generating variations in the form during its development. Perhaps, the success of the oscillation processes lies not in obtaining a resulting object, but rather in the multiple sequences of encounters between the idea and the different territories, a 'series of open and flexible systems generated'. The continuity of ideas and forms developed in each project triggers 'series and families' which explore the transformation of an open and flexible system into different realities, building 'constellations' and 'genealogical trees'[14]. [Fig. 08]

The territory of the intellectual starts from the oscillation processes that result in what are called "non-hierarchical systems", i.e. mathematical field geometries. Non-hierarchical systems are not determined by a center, nor by axes, nor by a specific access point. Nor do they establish a predetermined limit form, but rather a set of local rules that match repeated geometric units. Despite the fact that non-hierarchical systems do not have a predetermined orientation, the MUSAC project adopts, in the combination of its geometric and constructive modules, a band arrangement. The project's oscillation processes allowed the models to test the series of open and flexible systems with different angles, neither too obtuse nor too sharp, in a balance between the expressiveness of the frame and its functional capacity (70º-110º). These non-hierarchical systems, or field systems, make for unlimited horizontal growth, determined solely by contextual conditions. [Figs. 03, 06, 07 & 10]

The geometric and material: from rules to superposition of combination systems

The territory of geometry and material is perhaps the most disciplinary territory of the project, where the built form is defined. Geometry merges all aspects of architecture, giving it unity. The simpler a geometry, the simpler its architecture. The simplicity of a geometry enables its systematization and, therefore, its repetition and transformation. During the process of a project, the geometry must be able to change if it is to better adapt to needs. The system introduces a set of constraints that make it possible to vary its geometry.

In 2012, Enrique Walker published an essay titled "Scaffolding", in which he distinguishes between "restrictions" and "self-imposed restrictions", the restrictions being external, involuntary, and imposed by agreement, and the self-imposed restrictions being internal, voluntary, arbitrary and open.

In a conversation[16] between Stan Allen and Enrique Walker, carried out by email in January 2016, the debate between restrictions and rules in the formulation of

the contemporary architecture project was reopened. The algorithm used by OuLiPo[17] as a restrictive system derived from mathematics is taken up anew and defined by Allen as a set of rules necessary to solve an architectural problem in a finite number of steps. The success in choosing the rules is determined by its ability to embody change without altering or compromising the internal logic of the project. Rules are a "reliable mechanism" for making 'changes and adjustments'[18]. Once a problem is identified, this is interpreted as a variable, to be used, after incorporatingf some rules, in the construction of a system. The adjustment of one variable determines the rest of the variables. The system becomes known and consolidated over time.

The early MUSAC sketches [Fig. 02] sparked interest in relating a simple, clear geometry of squares and rhombuses with a single elementary constructive system that would make it possible for the building to go up quickly and efficiently, through walls raised on the site and precast beams (500 identical 11m beams). This superposition of combination systems, between geometry and its construction, had been part of the architecture debate in the final decades of the 20th century. Meanwhile, Colquhoun recognized in the mat-building of Le Corbusier's Hospital in Venice [Fig. 09] the superposition of two combination systems: "one additive and the other geometric"[19], that is to say, a system of basic cells, capable of growing and developing, composed by the addition of elements, which are superimposed on a geometric system. In the field system of the Mosque of Córdoba [Fig. 10], Allen identified two principles of combination, "one algebraic and the other geometric"[20], understanding the algebraic as the combination of structures according to certain rules. The field system of the Mosque, formed by a structural combination system, constituted a "double serial system"[21] dictated by an "element-by-element"[22] behavior pattern, that is, a "combinatorial system by addition"[23], which composes each of the elements into parts. The MUSAC field system superimposes 'arithmetic' and 'geometric' combination systems. The system of geometric combination of square and rhomboidal modules that shapes the rooms and patios and skylights is superimposed on an arithmetical combination system, where the addition of walls and beams builds the structure in bands of space – open and discontinuous – for patios and skylights. [Figs. 04 & 05]

The historical: from the geometry of memory to the expanded concept of context

In this territory, it is necessary to distinguish between memory and history. While memory has to do with the language of the individual, to the personal, to how each person remembers things, causing a certain alteration or distortion in the gaze and in their own actions, history has to do with the language of the collective, of the universal, accepting each other as objective, although in the end each historian makes his interpretation of facts. In 2003, in an essay titled "La geometría oculta de la memoria"[24], published in issue 111 of Circo fanzine, Tuñón stated that architecture, both in the act of drawing up a project and in actual experience, resorts to memory and history to analyze a thing, and graphically expresses it through geometry. His reflection on geometry not only takes geometry for what it is and can do, but also for those things it refers to. This relational condition between geometry, memory and history could be a response to the intention of the architects to establish metaphorical associations with the shape of the project, "visual metaphors"[25], which enables it to be conveyed as a recognizable collective image. In the MUSAC project, the abstract image of the rivers of Castilla and León, or the figurative images of the Roman pavement and the stained-glass window of the Cathedral of León, are used to convey the geometry used in the project.

When there are no elements in the physical context to start a project with, architects resort to the "expanded concept of context"[26], which allows them to look at history and build narratives [Figs. 04 & 05]. The context around the MUSAC was interpreted as a *non-place*, an emptiness, devoid of references, which had to construct a context story of its own. In the search for contextual elements to relate with, the architects looked to the origin of the city of León, the Legio VII Gemina, a Roman legion which by AD 74 had built its base camp in what is now the city center. They selected a mosaic, composed of a geometry of squares and rhombuses, justifying it through its connection to the legion. Using "scaling" as a strategy taken from pop art, they manipulated the scale of the mosaic geometry until it became the space and shape of the floor plan and, by extension, the layout and structure. While the choice of a geometry adapted from a Roman pavement as the origin of the form of an architecture project can cause a certain randomness and confusion, the optimistic experimental reading of the architects led them to the discovery of two project techniques: "mosaics", additive, open, flexible systems capable of establishing configuration rules between their forms, maintaining their interconnection and allowing them to grow and adapt to any limit; and "hyperpoints"[27], deployable, articulated systems capable of transforming an initial unitary form, compact and closed in a final fragmented, unfolded, open form. Both systems appear intuitively in the first sketch of the project. [Figs. 02, 03, 06 & 07]

The second story began with the selection of a main public space in the city of León, its medieval Cathedral (13th century). Mansilla and Tuñón located the oldest stained-glass window in the Cathedral, featuring hunting scenes, and selected the image of "El halconero" as a reference [Fig. 05]. Through the operational strategy of "pixelization", the image was digitized, cropped and geometrized thanks to computer tools, transforming figurative to abstract and manipulating color through scale. Once the image, colors and position of the 'pixels'[28] were simplified, they were adjusted to the shape of the construction elements of the main façade, which frames the public square. The authors referred to this appropriation mechanism by the colloquial expression "turning the sock around"[29], as it enabled them to build the outer skin of the MUSAC's public open space from the inner skin of the cathedral's public space. In the MUSAC, and by extension in the overall work of Mansilla + Tuñón, geometry serves as the starting motor of the project process, which is present until the end as form and image, "formal structure" and "formal appearance"[30].

The artistic and social: from 'no logo' to expectant spaces

In the final phase of construction, a competition was called to define the project´s logo. Based on the requirements of the museum, the architectural interpretation that could be made of the building, and the interests of the contestants, a Basque team won with a "non-logo" proposal. The proposed logo did not contain a design, but a word that could be applied by anyone, in any way and anywhere. For the architects, the 'no logo' expressed MUSAC's vocational nature of MUSAC, its 'renunciation of design', its capacity for 'variability and transformation', and its activation through collective participation[31]. The winners of the contest may have been familiar with Naomi Klein's essay *No logo*[32], a reflection on the concept which forms part of contemporary debates and concerns. That same year, Mansilla and Tuñón carried out the transfer of the five letters of the Museum of Castellón, MUSEU, used as a tool for the production of meanings.

In the evolution process of the office, the relationship between people, art and space has been undergoing changes in the course of over fifteen museum projects[33], from the Museum of Zamora, a closed "chest-box" organized chronologically through a succession of spaces, or the Museum of Castellón, a closed "chest-box" that introduces a public space diagonally through double heights, or the Museum of Royal Collections, a semi closed "screen-box" with permanent contents and a descending path, to the MUSAC, a "checkerboard and its pieces"[34], or an open and flexible system, a continuous public space, without hierarchies, without limits, and with a free visitor route. A dynamic space of a social character, where the spontaneous, the temporary, the abstract and the diverse nature of the contents is bound to the permanent, the spatial and the specific character of the container. In contrast to traditional museums, where people visually relate to the items on display, in contemporary museums people interact with the works, participating in them. The rooms and courtyards, similar yet different, become "expectant spaces"[35], spaces waiting to be used in different ways, from an exhibition set up with drawings by the citizens of León for the museum's opening, to facilities where ½-scale housing prototypes are built in situ, such as the flower house by SANAA.

The study of function in the project involved a process of interpretations of its surfaces, of how much its spaces could be neutral open spaces where different activities and a great variety of contemporary artistic

manifestations could be accommodated. The requirement that the museum have a strong social bent led to intermingling programs that were previously separated. A space's degree of expectation is determined by its 'programmatic flexibility'. However, in contrast to the "compartmentalized flexibility" proposed by Rem Koolhaas, where the program is divided into flexible sectors, the expectant space, intended for cultural expressions of contemporary society, must be continuous, transformable and extensible, free and adaptable. The expectant space is unspecific; one same form can contain any part of the program. There is no distinction between interior and exterior spaces, between what is public and what is private, what is temporary and what is permanent, all areas being accessible to and usable by everyone. The spatial richness of the container, ever ready for a change of content, results in a different experience each time. Expectant spaces for collective contents continue to evolve long after completion, with the promise to remain relevant despite changing contexts and needs. This gives the museum the status of an "unfinished architecture"[36]. [Figs. 04, 05 & 10]

The natural: from flocks of birds to field systems

Tuñón approaches the concept of *fields* – through an essay written in 1996, titled "Campos y singularidades: (logística del contexto)"[37] – as one of the *Conceptos desplazados* of his doctoral thesis. In the wake of a dialectic between the field theories of Attilio Marcolli[38] (1968) and Wiel Arets[39] (1996), Tuñón proposes a third line of approach to the concept, perhaps more akin to his interests, enunciated by Stan Allen, in his article "Distributions, combinations, fields"[40]. The text analyzes how architecture responds to complex, non-hierarchical configurations through what it calls: "local patterns"[41] and "logistics of the context"[42], and uses as an example, to illustrate its concept of field, the study carried out by Reynolds on 'flocks of birds'. The conclusion arrived at by Reynolds[43] was that, given some laws of local-pattern behavior (separation, alignment and cohesion), a global group form was generated, one which was capable of adjusting to changes, independent of the number of "boids".

Mansilla and Tuñón's constant observation of nature and reflection on the forms of things lead Mansilla and Tuñón to take an interest in plowed agricultural landscapes, whose rigid internal arrangements are counteracted by their free perimeters. In the search for a more versatile and flexible floor plan organization, with its connection to geometric meshes and mathematical fields, they use a set geometry, and systematize it to come up with as many variations as possible, without renouncing the rigidity of the internal structure; a configurative process "from the pattern to the notion of field"[44]. From sociology, Pierre Bourdieu brings a complementary view to the notion of the mathematical field, defining it as a social space of action and influence, a specific sector of social activity where networks of superimposed social relations converge: the one that produces art, the one that organizes it, and the one that consumes it, determined by the rules of the field.

Field systems are structures composed of local patterns and context conditions. While local patterns define the geometry, construction and behavior of a module, relating it to those around it, the context conditions determine the boundary shape and size of the system. The alteration, deformation or local fracture of a system, within limits, does not imply its rupture. A field system can adopt different local developments, or different boundary forms, as long as the internal rules of the elements that give it unity are unchanged. The behavior of a local pattern, which is repeated, determines the global behavior of the system. Field systems admit the occasional inclusion of 'singularities', or 'exceptions' to the rule, releasing them and enhancing certain properties of the elements that compose it. Within a field system the exceptions can be in its arithmetic combination system or in its geometric combination system. The MUSAC is a field system, governed by local pattern behavior rules, where each square and each rhombus reports what is happening around it, how the other squares and rhombuses are placed. However, they do not report what the perimeter of the project is like. When squares and rhombuses are combined to configure the geometry and construction of the expectant spaces, adopting the condition of a room, patio and skylight, the field is blurred. [Fig. 04 & 05]

Transformation constructs a relationship of continuity

The walk through the six territories does not intend to be a closed operative manual for the development of any contemporary project, but rather an open, characteristic example of the concepts and techniques used by Mansilla and Tuñón to get to the origin of the form of the MUSAC project. The circular, counterclockwise order, supported by a diagram drawn up by the authors, runs through the territories sequentially, one after the other, seems intentional rather than accidental, and pursues a theoretical framework that is consistent with their own creative process and with the result of the project. Although the narrative of a project process can simulate a real process, with the purpose of simplifying its complexity and in so doing building a clear, conveyable structure, the critical analysis of the geometry facilitates reconstructing a possible logical order for a hypothetical real design process. Beyond refuting or confirming a correct order for the process, the article[45] acknowledges that the territories overlap and interweave – that they are not watertight, which presents the possibility that there were different simultaneous orders – and focuses on transits,or transformations, that are produced, from the concepts selected in the proposed territories to the project techniques used to shape the project, where all the territories come together. The appearance of other concepts, techniques and territories complements the discourse.

Among the open debates in the narrative of the MUSAC project process are two similar but different abstract systems that should be distinguished: expressive systems and field systems. Field systems, like expressive systems, build a rigid starting pattern, thought out from the angle of the floor plan and determined by local behavior patterns. However, the subjective component of field systems, apparently random, is the system's response of adapting to the conditions of the context, and any variation or specific alteration of the system can be interpreted as a singularity or exception, characteristic of the field systems. Even the expressiveness resulting from the breaking of orthogonality maintains field conditions. Meanwhile, expressive systems use subjectivity as random freedom of the section, making each module a relatable unit on plan, but different and independent in section. This difference can be understood when we compare MUSAC with other projects of Mansilla and Tuñón, such as the Cantabria Museum or the Algeciras Migration Museum.

Every project involves a transformation of what surrounds us. If "architecture is nothing but life that simulates nature"[46], it is in the transformation of nature itself that architecture makes inhabiting possible. The MUSAC represents a turning point in the work of Mansilla and Tuñón, as it introduces, through open and flexible systems, the capacity for transformation in the projects process and in the built work itself. Transformation is a contemporary condition,which allows a system to be adapted to the needs of a constantly changing reality. Freedom, subjectivity, expressiveness, randomness and variability are in some way forms of transformation. The transformation turns one thing into another thing, the same yet different, establishing common relationships between things and enabling them to continue over time. The evolution of ideas and forms unleashes 'series and families' capable of building associative structures, such as constellations and genealogical trees; in other words, the transformation builds relationships of continuity.

1. CIRCO MRT Coop. is a cooperative of thought, founded in 1993 by Luis Moreno Mansilla, Luis Rojo and Emilio Tuñón, where they developed open, uninterrupted conversations about architecture and life, between researchers, teachers and architects.

2. Luis M. Mansilla and Emilio Tuñón, "Innovación y tradición en la arquitectura contemporánea: MUSAC. Seis paisajes" in *Cuadernos de Proyectos Arquitectónicos* nº1. (Madrid: DPA, ETSAM, 2010), 33-36.

3. The diagram was presented for the first time in a conference by Luis Moreno Mansilla, entitled "MUSAC. Seis paisajes", held on May 20, 2009 in the ETSAM Assembly Hall, as the closing ceremony of the 2008-2009 academic year for the activities of the White Chair. Recovered at *https://www.youtube.com/watch?v=hL-roLpnqLQ.*

4. Although, the narrative itself implies a linear condition in achieving places, concepts and tools, this does not represent the order of the process that followed the project, on the contrary, it was rather, the authors say, an "interwoden", that is, a spun of different times, some before and others after, with others that are discarded.
Luis M. Mansilla and Emilio Tuñón, "MUSAC. Seis paisajes" in *Circo* nº218, (Madrid: CIRCO MRT, 2016), 2

5. The concept of hidden geometry, used in the title of the article, responds to a hypothetical concealment of the real process of generation of the form. Not to be confused with hidden geometry, used by Emilio Tuñón, to refer to the recognizable image of a building through memory and history.

6. Richard Rorty stated that the success of knowledge, progress, is produced by the accidental coincidence between public needs and private obsessions. Richard Rorty, *Contingencia, ironía y solidaridad*. (Buenos Aires: Paidos, 1991) 1st edition, 4th printing [Ed. consulted]. *Contingency, irony and solidarity*. (New York: Cambridge University Press, 1989.) [Ed. original]

7. Emilio Tuñón, "El cuadrado y la cruz. Cuatro comentarios en torno a la repetición" *Circo* 10, (Madrid: CIRCO, 1993)

8. This trend was pointed out by Pascual Amphoux and Irene Scalbert in their essays in Sylvie Chirat, ed., *Constructing the town upon the town: transformation of contemporary urban sities: Europan 4* (Paris: Europan, 1997).

9. Coll defined the concept of mat as: 'flat piece of fiber fabric, rubber, cloth, straw, etc., used for protection on the floor, under dishes, etc', or as 'anything of great thickness, or densely interwoven' Juan Coll, "Mat-building", in *Circo* nº54, (Madrid: CIRCO MRT, 1998), 2.

10. Allison Smithson & Peter Smithson, "How to recognize and read mat-building", in *Architectural Design* nº9 (London, 1974), 573-590.

11. Conference by Emilio Tuñón, entitled "MUSAC. Seis paisajes", given at the MUSAC auditorium, León, on May 18, 2019. (00:21:00). Recovered at: *https://www.youtube.com/watch?v=HHzC30eqoSI*

12. Rafael Moneo brings together the lessons imparted, between 1992-1994, at the Harvard School of Design, on the work of: Herzog and de Meuron, Rem Koolhaas, Frank Ghery, Alvaro Siza, Peter Eisenman, Aldo Rossi, James Stirling, Robert Venturi and Denise S. Brown. in Rafael Moneo, *Inquietud teórica y estrategia proyectual* (Barcelona: Actar, 2004).

13. Theoretical concept, of philosophical origin, proposed in *La sonrira de Saturno* (1989), *El modelo de Frankentein* (1997) and, finally, consolidated in Rosa Rodríguez Magda, *Transmodernidad*. (Barcelona: Anthropos, 2004).

14. Luis M. Mansilla and Emilio Tuñón. "Arranque y oscilación. Embudos y duchas" *Circo* nº96, (Madrid: CIRCO MRT, 2002), 2.

15. Families associate species through form by constructing genealogical trees, and series associate species through ideas by constructing constellations. Alejandro Jesús González Cruz, Nicolás Maruri and Rafael Pina, "Las especies de Mansilla + Tuñón [1992-2012]. Una aproximación al origen de la forma en el proyecto de arquitectura contemporáneo", *Revista de Arquitectura*, 25 (38), (Chile: Universidad de Chile, 2020), 36.

16. Enrique Walker, "Scaffolding", in Giancarlo Valle, *Luis Moreno Mansilla+Emilio Tuñón. From rules to constraints.* (Zurich: Princeton School of Architecture and Lars Müller Publishers, 2012), 74-79.

17. Stan Allen, "Stan Allen in conversation with Enrique Walker" by mail, January 18-25, (Madrid: DPA, 2016) 60-67.

18. The OuLiPo Potential Literature Workshop, founded by Raymond Queneau and Francois Le Lionnais in 1960, was a group of literary experimentation, made up of writers and mathematicians, in search of new structure forms, dedicated to inventing new restrictive systems or algorithms.

19. Allen recognizes that contemporary reality is contingent, it changes and transforms, and the contemporary project should be able to adjust. Op.cit. "Stan Allen in conversation with Enrique Walker", 61.

20. Alan Colquhoun, "Interacciones formales y funcionales. Un estudio de los dos últimos proyectos de Le Corbusier", in *Arquitectura moderna y cambio histórico: ensayos 1962-1976*. (Barcelona: Gustavo Gili, 1978).

21. Stan Allen, "Distribuciones, combinaciones, campos (notas preliminares hacia una logística del contexto)" in *BAU* nº14 (COACL Valladolid, 1996), 68.

22. Moneo states that the formal structure of the Mosque is determined by the existence of a virtual intersection of two complementary systems. Rafael Moneo, "La vida de los edificios. Las ampliaciones de la Mezquita de Córdoba", in *Arquitectura* nº256 (COAM, Madrid, 1985)

23. Tuñón states that each element is related element to element, vector to vector, without global single laws, but isolated and independent local laws. Emilio Tuñón, "Campos de columnas " (1996) in *Conceptos desplazados.* Doctoral thesis (Madrid ETSAM, UPM, 2000), 144.

24. Gabriel Ruiz Cabrero, "Adiciones", in *Circo* nº17. (Madrid: CIRCO MRT, 1994).

25. Emilio Tuñón, "La geometría oculta de la memoria" in *Circo* n º 111, (Madrid: CIRCUS MRT., 2003).
26. Tuñón declares that visual metaphors are instruments of communication, not of generation. Emilio Tuñón, "MUSAC. Seis paisajes", lecture given at the MUAC auditorium, León, on May 18, 2019. (00:45:00)

27. Emilio Tuñón, "MUSAC. Seis paisajes", academic talk, held on 8.10.2019, given at the Tuñón unit (projects V and VI) in classroom 1G4 of the ETSAM, Madrid. (documented by author)

28. Based on the theory of the hyperplane, the hyperpoint is an extended concept of point, points that stretch and connect other points.

29. The pixel divides the image into equal parts, it is "an elementary unit of information associated with a combinable digital image". Manuel Gausa et al, *Diccionario metápolis de arquitectura avanzada*, (Barcelona: ACTAR, 2001), 468.

30. Emilio Tuñón, "Tras el MIES al MUSAC, Mansilla y Tuñón, una conversación en Barcelona" (Madrid: AV, 2006),88

31. Juan Antonio Cortés, "Geometrías activadas. La arquitectura de Mansilla+ Tuñón: una aproximación" in *El Croquis* nº161. (Madrid: El Croquis, 2012), 8.

32. Luis M. Mansilla, "MUSAC. Six Landscapes". Conference in Avery Hall, Wood Auditorium. (New York: GSAPP, 2010) (0:05:00). Recovered at: *https://www.youtube.com/watch?v=Rgvnx_YrO4k*

33. Naomi Klein, *No logo: el poder de las marcas*. (Canada: Picador, 1999).

34. Luis M. Mansilla and Emilio Tuñón, "Quince años, quince museos. Un itinerario provisional" (2011) in El Croquis nº161, (Madrid: El Croquis Editorial 2012), 392-395.

35. Op. cit. "Geometrías activadas. La arquitectura de Mansilla + Tuñón: una aproximación", 20.

36. Emilio Tuñón, "MUSAC. Seis paisajes", academic talk, held on 8.10.2019, given at the Tuñón unit (projects V and VI) in classroom 1G4 of ETSAM, Madrid. (documented by author)

37. Ilana Altman, "Expiry and expansion: unfinished architecture", in Giancarlo Valle. *Luis Moreno Mansilla+ Emilio Tuñón. From rules to constraints.* (Zurich: Princeton School of Architecture and Lars Müller publisher, 2012), 80-87.

38. Emilio Tuñón, "Campos y singularidades" (1996) in *Conceptos desplazados.* Doctoral thesis (Madrid: ETSAM, UPM, 2000), 136.

39. Attilio Marcoli, *Teoría del campo, curso de educación visual*. (Madrid, Xarait, 1968)

40. Wiel Arets, "Campos" in *BAU* nº14, (Valladolid COACL, 1996).

41. Op.cit. "Distribuciones, combinaciones, campos (notas preliminares hacia una logística del contexto)",73.

42. Local patterns are rules of specific behavior, which in their accumulation generate a new global behavior. Global laws are not a direct transposition of local laws.

43. Allen defines context logistics as the specific operational framework where each field acts as such, without losing its identity.

44. Mansilla and Tuñón used Reynolds' example, to explain the field structures as proposed by the MUSAC model. Reynolds implemented an order system, where each bird had an associated speed and flight distance with respect to the others, and in this way, flocks are generated that, regardless of the number of elements that you enter, always end up having a coherent form. Cristina Diaz Moreno and Efrén Garcia Grinda, " Una entrevista con Luis M. Mansilla y Emilio Tuñón" in *El Croquis* nº161, (Madrid: El Croquis editorial, 2012), 180.

45. Elena Farini Orleans-Borbón, *Procesos configurativos. De la trama a la noción de campo en los mat-buildings*. Doctoral thesis. (Madrid: DPA, ETSAM, UPM, 2013), 319-366.

46. The article is a synthesis exercise of a more extensive descriptive and critical analytical development, which constitutes a chapter of his doctoral thesis, where field systems are presented as a contemporary tool capable of responding to the new, ever-changing challenges of our society. For the elaboration of the graphic material, we had access to the Archive of the Mansilla + Tuñón office and to the "personal suitcase" of Luis Diaz Mauriño, in addition to having the invaluable help of Emilio Tuñón and Andrés Regueiro.

47. 'la arquitectura no es sino la vida que se finge naturaleza', Luis M. Mansilla, "Apuntes de viaje al interior del tiempo". *Arquithesis Collection* nº10. (Barcelona: Caja de Arquitectos Foundation, 2001), 11.

Systems of field
Play rules
Geometry
Origin
Form
Project
MUSAC
Mansilla & Tuñón.