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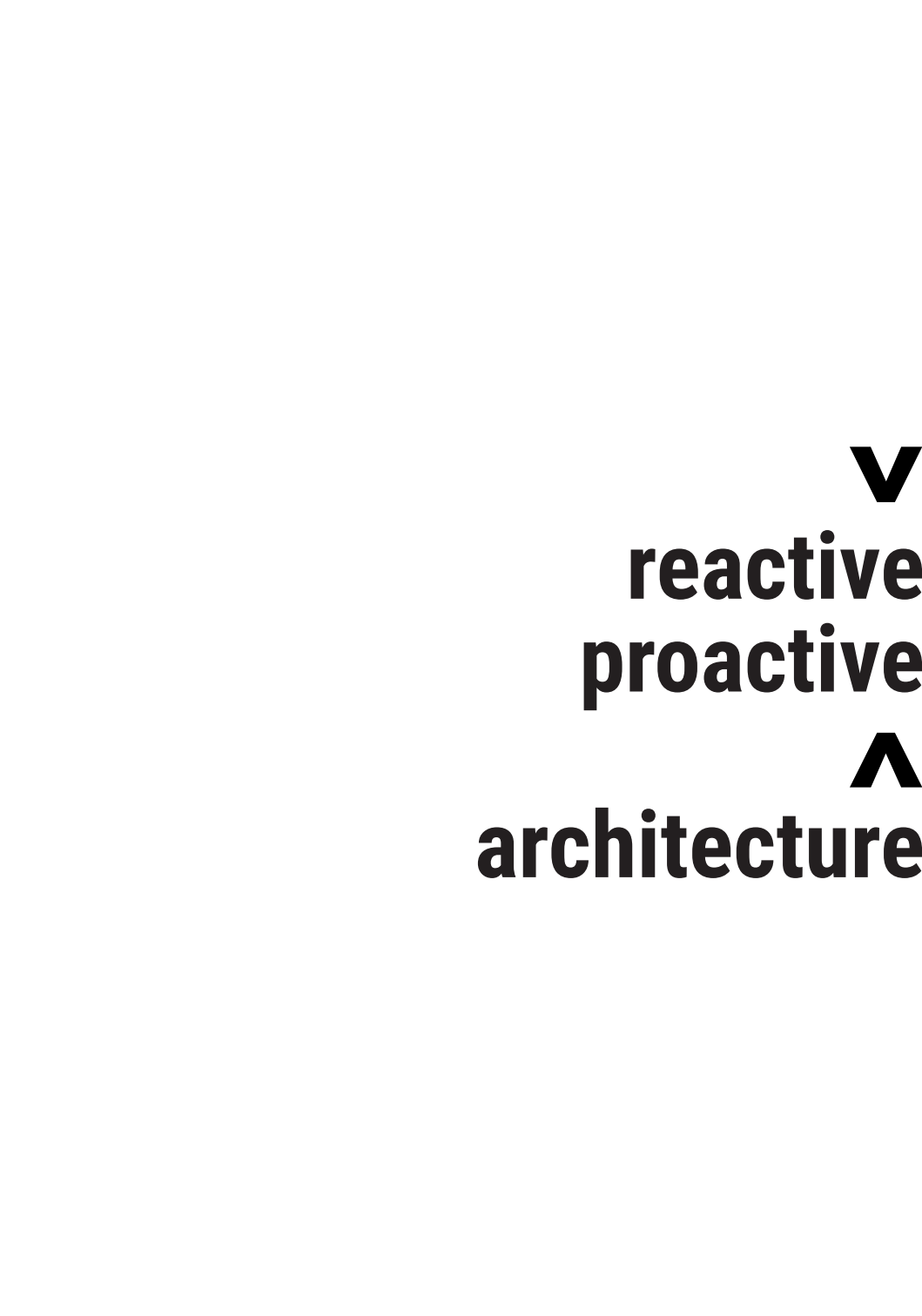
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UNIVERSITAT POLITÈCNICA DE VALÈNCIA

ESCOLA TÈCNICA SUPERIOR D'ARQUITECTURA

Coordination and design:

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Marcos Lizondo Chardí

Publisher:

Editorial Universitat Politècnica de València,2018
http://www.lalibreria.upv.es

ISBN 978-84-9048-713-6 (versión impresa)
Ref: 6472_01_01_01

The contents of this publication have been evaluated by this Scientific Committee:

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INTRODUCTION

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Architecture schools in developed countries are educating more architects than ever. After graduation, a vast, diverse and exciting labor market awaits them. The traditional professional practice in architecture that we used to know was configured after the armed conflicts in the first half of the twentieth century. A whole continent had been devastated by the world wars and the urgency to rebuild it, mainly to provide dwelling and to restore infrastructures, marked a way of practicing architecture for many years. Those decades were followed by others of economic boom and subsequent population growth. By then, practicing architects faced a meaningful amount of commissions focused essentially in new buildings while they lightly give way in urban planning and other traditional architectural issues. That scenario defined the expectations of our students for many years and became a risky synonymous of success among their peers.

This model is being nowadays substantially complemented by new professional tasks as a result of the imposed period of reflection propitiated by the economic circumstances of the beginning of the present century. The global economic crisis hit especially the western economies. Many European countries such as Spain, with a crisis in the construction sector which lasted from 2007 to 2017, saw how their increasing amount of practicing architects were forced to reinvent themselves and the practice of architecture itself. Contemporary architects are now becoming aware of which jobs they can undertake beyond the habitual ones. Perhaps this recently recovered awareness of our capacities might be accepted as one of the few positive legacies of these tough times. But architects are also becoming aware of how society should change in order to avoid committing the same mistakes from the past, and especially of architecture's leadership in these changes.

History teaches us that architecture has always emerged strengthened from any crisis period. Frequently, architects knew not only how to react to the new circumstances but also how to promote changes from the architectural production itself, and from the underpinning values and reflections that preceded this architectural production or that even are developed simultaneously in an experimental process which never ends.

Our schools, faculties and departments have been devoted until recently almost exclusively to education. But now, a consciousness of the importance of developing research tasks in the same way that other humanistic and scientific disciplines have done has been raised. We have now learnt that architecture is the right discipline for providing answers to a variety of demands put forward by today's society. And it is also the right discipline for posing questions that make society progress in a faster, adequate, fair and even unexpected manner.

Just as Spain played a notorious role in the reinvention of architecture professional practice within the global context, the Higher Technical School of Architecture of the Polytechnic University of Valencia quickly became aware of the importance not only of the imminent, necessary and laudable diversification of employment opportunities for its graduates, but also of the importance of research in architecture within this diversified panorama and its key role in the context of the school itself and subsequently in the context of all architecture schools in the world. An ambitious initiative began to take shape at the end of 2016 among the Valencian school faculty. The challenge was to put research in architecture in the foreground of academic activity in a decisive manner and to be a meeting point of researchers from all over the world and from any kind of discipline, but always linked to architecture and human habitat, whose works would react to the current society demands in an attempt to provide responses or whose investigations would pose new questions in order to design the future.

The strong determination of the event promoters wouldn't be satisfied with a one-time meeting. The desired international conference should

take up permanent residence in the school that was coming up with it with such a meaningful yearning. Therefore, with no additional artifice both the event and its name were born. The first edition of the Valencia International Biennial of Research in Architecture came into being. Quickly and broadly well known by its dynamic and lively acronym, the first VIBRArch was scheduled for the 18th and the 19th of October, 2018.

Potential participants were encouraged by the aims of the conference. According the text displayed on the website of the event and which remains up to date and relevant, every society has the right to progress. Each generation should be able to warrant better living conditions for the next generation by means of commitment and tenacity. Research, development and innovation constitute the starting point in order to achieve progress. Regarding architecture, universities, practitioners and firms have developed a remarkable research activity over the years. But occasionally, society and public administrations do not have a clear perception of it as they do with other disciplines. Therefore, the aims of the first edition of the Valencia International Biennial of Research in Architecture were:

•To place in the spotlight research in architecture as the indispensable mechanism in order to warrant progress in human habitat.
•To underline the value of the research potential of architecture schools and faculties from all over the world so as to get the attention of those entities that can fund research.
•To underline the value of architecture's daily practice since most of the works require a previous research and many times the final product constitutes a research product in itself.
•To underline the value of research in the business community which is much more than commercial possibilities of newly developed products and techniques.
•To become a meeting point for those which develop their research in architecture or neighboring fields.
•To highlight architecture's multidisciplinarity as a melting pot of multiple approaches, points of view and expertise.
•To become a platform for presentation and debate about studies, findings, novelties and contributions in architecture, encouraging many more to come.
•To showcase researchers in different fields and with different expertise for specialized journals, firms and institutions.
•To open new perspectives for architectural research and to promote the development of multidisciplinary and inter-university networks and research groups.

For all those aspirations, this first edition of the biennial was open not only for architects, but also for engineers, scientists, economists, sociologists, philosophers, anthropologists, geographers, historians, artists, designers, critics, journalists, lawyers, politicians and any academic, practitioner, professional or students with a determination to develop research in architecture or related fields.

Such an ambitious endeavor in terms of scope and potential audience required arranging all proposals in the making according to up to seven thematic areas. Most of their names might remind us the different departments that usually teach in a school of architecture. But this fact shouldn't be understood as an uncomfortable strictly academic drift. On the contrary, since architecture schools thoroughly prepare their students for any aspect of professional practice, a systematic list of scholar disciplines usually means a trustable list of professional fields and labor opportunities. This book has been structured according to the same seven thematic areas employed during the event, so as to allow the reader to focus on a specific matter of his or her interest. Hence, after this introduction seven blocks of chapters are offered. Each block is introduced by an especial chapter written by an acclaimed author who will provide his or her understanding of the state of the art in this matter and will share his or her last works on the field with us. This introductory especial chapter precedes a set of different chapters on the works of many of the event attendees.

So far the reader must have noticed that doesn't have conference proceedings in the hands. That would have wasted the opportunity that

gathering all researchers in Valencia for two days meant. The contents of the presentations made in the framework of the first VIBRArch were reconsidered after the event as a result of the intensive debates held during the fruitful plenary and parallel sessions. Therefore, each chapter is not only the contribution of the author of the research but also the contribution of many other researchers who provided their insights during the conference, being that the reason for such a long lapse during the closing of the biennial and the publication of this book. That fact adds an unexpected but wonderful final achievement to the list of aims of the conference which is that the biennial was an amazing laboratory for composing a book on the current state of research in architecture. In many cases, the members of the scientific committee of the event agreed on extending their supervising work and the contents of the chapters have been reviewed as well, endowing this publication with a noticeable quality.

The first block of chapters focuses on "research by design in architecture". It is widely accepted that too often the discipline of architecture carries since the middle of the 20th Century a deep segregation between both scientific and rational knowledge, and factual knowledge which is derived from the experience of the building itself. Hence the distinction between objectivity and subjectivity has been undermined since the 1960s. Different paths can be followed when facing this polarity and not necessarily self-sufficient: case research that can provide knowledge for the group, or group research that tends to provide guidelines of interest for the case. But from the whole to the parties of from the parties to the whole are not the only possible approaches, since systemic architecture considers the case as an example of the behavior of the general organism and consequently connects with it by means of the rules and laws that govern it. Anyhow, the inexistence of consistent accounts on an uncertain and undervalued future makes each project experience and opportunity, maybe unique, for enjoying and experimenting, turning it into a sounding board of what we have and what we miss. In this context, four possible challenges in design research emerge: revising again the dissociation between theory and practice; deepening in that rupture through time dimension; taking back research to widened disciplinary keys, which are also reviewed, transversal and pierced by the changing social and cultural foundations; and finally fostering that the aesthetic review leads the way for transformation.

The second block of chapters is devoted to "ethics, critical thinking and narrative in architecture". The term "architectural narratives" refers to a kaleidoscopic approach from architectural practice due to the lack of universalizable certainties. The necessary factual enlargement is linked to a troublesome scenario: society prescribes educational profiles endowed with a decreasing critical force, favoring profitability; the hermeneutic hurricane of the turn of the century has skirted intrinsically architectural debates, so as to deepen in speeches highly influenced by the exterior such as identity-autonomy, authenticity-simulation, and so on; and finally the fight among three different positions regarding the information overload typical from the information age which are the need of scientific communication for concordance between rational true and factual true, the formal postmodernity relativism; and the post-structuralism or those oppositions between critical postmodernity and radical criticism which bear the debate on the lack of limits for interpretation. This block encompasses works on ethics, critical thinking and narrative in architecture which encouraged debates on totality and territory, technology and nature, design and action, multidisciplinarity, aesthetics and many more.

The third block of chapters deals with "ideation and representation in architecture". Not frequently found on the covers of architecture research journals, graphic expression appears as a vivid field for architectural experimentation and research in synergy with many other disciplines related with research in architecture. This block encompasses a few works from different fields of architectural graphic expression focused not only on depicting or narrating architecture, but also on new methods for conceiving it. Research activities on new graphic survey techniques, new modelling and render methods, and even new

ways for depicting urban flows and dynamics were debated in the intensive common sessions which led to this publication.

The fourth block of chapters focuses on "city, territory and landscape". These three linked topics with their own internal and external dynamics and with their different scales constitute thrilling research scenarios to be tackled from multidisciplinary and interdisciplinary points of view. Among these contexts, urban fabrics and public space constitute a base for research from morphological, functional, social and environmental perspectives. This thematic area includes reflections on the geographic field of the city, the territory and the landscape, also including those tools for its analysis and interpretation such as cartography, big-data, etc. Among many others, the hereafter topics were discussed: human scale, morphology and activity in the city; occupation, sustainability, permanence, transformation and mobility regarding territory; and landscape as cultural heritage, natural scenario to be protected or recovered, rural or urban, and many others.

The fifth block of chapters is devoted to "building technology and advanced materials". The specificity of the architecture education in Spain which endows its graduates with a strong technical background makes this field a must and not only for invited engineers. Only innovative building systems and evolved materials will make possible to satisfy the ever more demanding comfort levels and social ambitions. This thematic area includes works on many different topics related to these demands and ambitions such as building smart monitoring; innovation solar and wind control systems; building techniques for a better building energy efficiency; implementation of renewable energy systems; building materials and techniques which reduce CO2 emissions; continuous innovation and improvement in conditioning techniques; and new materials, methods and building techniques in structures for architecture.

The sixth block of chapters deals with "theory and criticism in architecture". Nowadays it is widely accepted that in the current architecture context it is important to reflect upon the role of theory and criticism in order to determine strong foundations for knowledge, evaluation and design in architecture. On one side, it would be helpful to review the current validity of contributions in theory and criticism from the past, as well as relevant contributions from other disciplines such as philosophy, arts, science, sociology, engineering and many more. On the other side, it is also interesting to track links between theory and criticism with the current architectural practice and the goals of contemporary society, focusing our attention in specific questions such as housing which should provide a response for the new ways of living and for the different society groups.

Finally and surprisingly successful, the seventh block of chapters focuses on "architectural heritage and conservation". The interpretation of history has traditionally opened new ways to build the future. The geographical and timescale framework is vast enough to cover stages which comprise from ancient cultures to contemporary times, being a transversal and multidisciplinary approach an interesting endeavor. This thematic area encompasses works by researchers interested in critical reading of history of architecture, and history of construction. Architectural heritage and conservation constitutes, undoubtedly, an extremely window of opportunity in modern practice that has induced the development of many fascinating research lines and even the questioning of the concept of heritage itself.

This book shows the results of the works on research in architecture of a meaningful group of researchers, which includes academics and practitioners, from all over the world. It constitutes a wonderful picture of how research in architecture is nowadays. The Higher Technical School of Architecture of the Polytechnic University of Valencia is pleased to share it with all of you.

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BLOCK 1: RESEARCH BY DESIGN IN ARCHITECTURE

INTRODUCTION TO BLOCK 1

(RE)SEARCHING ARCHITECTURAL DESIGN

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Architectural innovation and research

The professional architectural practice was for centuries the dynamic incubator of innovation in architectural thinking and creating. Architectural educational environments were the places where the innovations of the practice obtained their legitimization; either through theoretical elaborations of their values and principles, or through their further development and dissemination done by the virtuality of the numerous projects they elaborated as part of their teaching. As the key teaching figures of the Schools of Architecture were in most cases distinguished practicing architects, architectural innovation and the contemplation on the new values and priorities emerged from this very particular, and to a certain extent, peculiar relationship between education and practice. This bond was rather resilient as it managed to remain strong and alive during the so-called Beaux Arts tradition as well as during the Bauhaus dominance in architectural culture(s) of the 20th century. The former inclined more towards the artistic and intuitive pillar of architecture, the latter more towards its scientific and rational one. Both of them followed the nonlinear and unpredictable dynamics of the history of our societies and cultures.

The progressive adherence of architecture, as a discipline, to the rationality of sciences, opened the doors of the Universities to host Architecture as part of their education culture and tradition. Even in the cases where Schools retained their autonomy as institutions, their programs and education directives were profoundly affected by the internationally dominant academic spirit established by the end of the fifties. As part of academia, Architectural education was gradually detached from the request for the intuitive and empirical innovation, strongly aligned to the avant-garde practice, to create a new pole of knowledge generation, the Research. Innovation and Research appeared as a new bipolarity, driven by different bodies and looking through different trajectories of the 'new' in architecture.

Having to do with the 'to be revealed' after 'being questioned', research as an academic practice is always a perfect mirror reflecting the ways we are questioning in a certain period of history a domain of knowledge and interrogating the processes, paths and itineraries through which new understandings, considerations and speculations of this domain are revealed[1]. Research as an academic action aiming at generating knowledge, insights, and understanding of a discipline, is a dynamic process always conditioned by questions motivating it. Research questions are always the driving force of research shaping its practices, determining its methods, forming its tools and ordering its outcomes. As these questions emerge from the dynamics of variable and unstable cultural and economic environments, they do not remain steady, fixed or static, but they are in permanent (trans)formation, (meta) morphosis and (re)consideration. If researching the design research would be a question, then the investigation of the core questions would be the appropriate vehicle to reveal the dynamics of the evolving and permanently modified intellectual background of design research activity. What changes can we detect in the research ethos and questions addressed by researchers in the domain of architecture and how are they linked with the broader environment of architecture thinking and practice?

Academic research in architecture has a rather short history given that doctorates, as a proof of

[1]It is interesting to note that in the Greek language, the verb 'to question' (ερωτώ) has the same root with the verb 'to research' (ερευνώ). The common root is the verb 'έρώ' which etymologically express an act of speaking or operating but in the case of the verb 'to question' the purpose is to make something to be heard while for the verb 'to research,' to be revealed. (Spiridonidis 2014 pp. 192-193)

research excellence across a broad spectrum of disciplines, emerged in the beginning of the 19th century[2]. Doctorates in architecture were initiated in the early 1960s in the USA by Schools of Architecture attached to Universities (University of Pennsylvania, Cornell Princeton, and MIT, Columbia, Harvard) and in the same period in Europe. These first doctorates focused almost exclusively on the history of architecture and the technological part of the building like analytical studies of their performance, as the declared need at the time was to generate excellence in knowledge on architecture and its materiality to support the development and the teaching of this subject in Schools of Architecture. Since then, Architectural research was institutionalized, and its further development was dependent not only upon the dynamics of changes in the discipline and practice but also upon the internal and contextual policies of the institutions it was dependent upon.

Schools of Architecture nowadays have become the ambitious nests of architectural research to generate new architectural knowledge. As the mission and social project of academia is not only to transmit but also to create knowledge, Schools institutionalize their research record through doctorate programs. Significant production of doctoral research, even though not yet systematically recorded, can be estimated in Europe, in an average number per year to be between 110-140 doctorates[3]. However, the vast majority of schools with a research record are producing academic knowledge which has somewhat limited operational value in practice and a restricted impact on the production of the built environment. Even though they contribute to the generation of new architectural knowledge, Schools of Architecture remain, to a large extent, transmitters of the innovation generated by the advanced experimentations happening in a distinctive part of architectural practice or by research in the domain of the building industry.

This broader environment of architectural research does not remain stable over time. Various approaches can be detected and related to the socio-cultural dynamics in which architecture as a domain of knowledge and practice is dependent upon. These approaches are formed under the influence of the altered disciplinary priorities emerging from the way architecture is conceived in different periods of its history[4] as well as from the socio-political environment which controls the market and the administration of Higher Education Institutions.

Architectural Research under the scope of the Sciences

Research about[5] Architecture

In its early days, Architectural academic research was conceived as scientific research, or rather an objective investigation of 'problems' in which the observer had to retain a distance from the subject of observation to avoid any possible interference on the observed subject. This science-centered approach was built upon a conception according to which all humans have the same basic natural needs. Architecture had to rationally assure these needs, guided by their measurable components. The necessary spaces to host these needs were provided by the scientific analysis and the ergonomics in the form of universal standards, going beyond any variations due to geography, society, and culture. Following the positivistic model of scientific knowledge-building, these research approaches conceived research as an objective verification of previously formulated hypotheses. Their fundamental dogma was based upon the (hypo)thesis that the quality of architecture can be enhanced by enriching knowledge on the history of forms, on the performance of their materiality and on the rational processes through which these forms had to be created. All this knowledge had to be investigated under the scope of the sciences.

[2]Cf. Dunin-Woyseth, (2005), p. 83.

[3]Cf. Voyatzaki, M. (2014), where the doctorate experience of Schools of Architecture in Europe is presented and analyzed.

[4]Cf. in Spiridonidis, C. (2009) the presentation of the different paradigms of architecture and architectural design during the last sixty years.

[5]The terms research about, for, by, through design do not have a common content neither between the researcher not in the relevant literature. This is why redefine each one in the context of this presentation. For the different definitions Cf. Jonas, W. (2007, p.191), Till, J. (2008, pp. 7-8) and Dunin-Woyseth, (2005, p. 83-88).

Research for Architecture and Design

In the scope of this approach, architectural design was considered as a problem-solving activity based upon rational and scientific grounded decisions. The research question this approach addressed to design was 'how we could define a process which could assure rationality and transparency'. Dominant design methods in the sixties and the beginning of the seventies were a typical expression of this research approach FOR a (better) design outcome, consistent to the set of values dominant at that period of time.
In order to solve a design problem, the architect had to de-compose rationally the space to be created in distinct elementary functional units and to identify the appropriate relations between them. The measurement of the main characteristics of those units together with the relations between them assisted the designer in re-composing the analyzed space in a new rational order. Rationality and transparency in design were two fundamental values of this rational paradigm. The 'glass box' experimentations encompassed the academic research expectation to define reasonable steps in the design process to assure a better quality of architecture and to eliminate the risky intuitive interference of the architect's subjectivity.

Architectural Research under the scope of the Humanities

Research about Architecture

The recognition by the Universities of the research about Architecture as valid scientific research rewarded by the highest academic degree, the doctorate or the Ph.D., offered the possibility to the academic research to be extended in the domain of Architectural Theory. Postmodernism in the seventies and the eighties accentuated the social and cultural nature of the human and questioned its conception as natural species. In this context, Architecture established new research questions addressed to humanities through disciplines like sociology, political sciences, psychology, semiotics and later on, in the nineties, philosophy. Thus, doctorates in the History and Theory of Architecture focused on the way these disciplines could use their scientific tools and premises to offer a better understanding of architecture as a socio-cultural phenomenon emerging in their academic territory. All these research experiences strictly followed the rules of academic writing and research ethics and, in their majority, were guided by the methods of inquiry developed in the humanities. Their impact on architectural practice was minimal (if any).
The shift from the sciences to the humanities in the construction of architectural knowledge and the continuous use of research methods borrowed by the disciplines attached to each one of these two domains raised the issue of the need for the discipline of architecture to be founded on its own epistemological premises. The ambiguous and unstable location of Architecture between sciences and/or humanities raised the request for more precise coordinates of Architecture in the established spectrum of the domains of knowledge. To escape from this hybridization, Architectural academia in the eighties started to investigate the epistemological foundation of Architecture by introducing a new research dogma. Since novelty is the fundamental component of architectural creations. It can only be empowered by enhancing the knowledge on architectural ideas, meanings and other intangible references motivating the creative process and not by defining measurable rationalities to guide design processes inspired or even imported from decision theory, systems theory, and engineering. As the humanities always questioned the absolute research objectivity, this new approach, by 'legitimizing' the subjectivity as necessary constitutive of creation, raised the issue of its involvement in academic research.
The important consequence of this new shift is the emergence of Criticism as a specific discursive category, which by encompassing subjective and objective statements, became an attachment initially to, or an embodiment in the History and Theory to obtain, progressively by the nineties, an equal status as part of the trilogy History-Theory-Criticism (HTC). Architectural Criticism was not considered as a "fault-finding" process but as an instrument, either to uncover

truth from meaningful signs or to preserve it into expressive formal settings[6]. Either attached to the revitalized, in the seventies, Frankfurt School critical theory as a neo-Marxist approach, or to the Criticisms of the Radical School of Lacan and Derrida in the nineties, Architectural Criticism became the dominant theoretical discourse and as such, subject of academic research. However, research related to Architectural Criticism appeared always dependent upon the methods and principles of the subject areas on which it was attached and backed up (for example semiotics, linguistics, hermeneutics) and it did not generate any pure architectural reasoning. In many cases the covered research objective was not only to reveal the hidden truths of Architecture but primarily to prove the operational value of the borrowed methods in architectural research.

Research for Architecture and Design

With Criticism, academic research in architecture is not only focused on its creations' connotations, but also on the ways these values and meanings are affecting and directing the creative action. Research for better Architecture and Design is now oriented towards the observation of the designers' behaviors, strategies, manipulations as signs of their thinking to create statements on the observed activity and elaborate useful conclusions. To assure this deep insight into the contents and the codes through which values form architectural creations, the Design research studies the designer's discourses to trace the paths through which ideas are embodied into designed forms.

In this approach, design research does not seek to formulate and implement methods that will assure a rational itinerary from the 'problem' to the 'solution'. The design is now conceived as a socio-cultural phenomenon, including natural and social components, and for this reason the design problems are 'wicked' problems[7], the solution of which is not possible to be ruled by predefined problem-solving processes. In the first steps of this epistemological turn, the request to generate knowledge on and for the creative practice was considered to be done by observing the behavior of the designer and by studying it through different subject areas like psychology, brain neurology, and behavioral sciences, sociology, politics, semiotics, etc. The association of the Architectural Research with these disciplines produced an impressive encyclopedic scientific knowledge. However, its impact was extremely limited on the quality of architectural production, on the enhancement of the responsiveness of architectural creation to the needs, demands, and requests of the culture and the society and to the articulation of a pure architectural reasoning for which it was initiated.

Research by Design

By the mid-nineties this research strategy was questioned, setting a new argument: While scientific observation and reflection wishes to reveal and describe something that is already present, creative practice deals with something, which does not exist and lies beyond the creative imagination of design practitioners. Even though scientific knowledge of comparable existing architectural phenomena can aid innovative speculations, there is no reliable evidence that the experiences of the past will be valid in the fast-changing, broader context affecting the spatial forms and arrangements. Architecture as the act of creation is neither a science nor an art. It is a creative discipline[8]. Consequently, research in architectural creation must not and cannot follow the rules of scientific research strictly. As a discipline, architecture aims at giving structure and form to social reality even if it is not able to fully explain it in scientific terms. All its actions are directed by the experience of this reality, which is the basis on which speculation on the representation of space is possible. On the contrary, the sciences aim at describing reality by knowing about

[6]Cf. Raman, G.P. and Coyne, R.(2000), p.83

[7]Cf. Rittel, H. (1974) pp. 273-276.

[8]The claim to recognize Creative and Performing Disciplines as a Sector with its Qualifications Framework is presented in the Report of Tuning Educational Structures in Europe Program entitled Towards a European SQF for the Creative and Performing Disciplines and the Humanities pp. 9-10. University of Deusto 2012. http://www.eq-arts.org/wp-content/uploads/2016/09/sectorial-qualifications-framework.pdf

its functioning-operation. These two different natures cannot be investigated with the same research method and ethics.

Architecture as a creative discipline needed its research method; a method in which the observer can be an actor of the observed practice. An external (scientific) observation of the creative practice can only describe a part of its reality, leaving its most significant part unrevealed. The involvement of the researcher in the creative process seems to be the only legitimate way to make this act subject to observation and reflection. This speculation introduced a new ethos into the established academic research tradition. The researcher not only observes but also acts on reality under observation. The research by design promoted as the proper method to research architecture and requested its legitimized position in academic architectural research. It is progressively established as the avant-garde trend of research on architectural creative practice by the turn of this century it is still at the center of the debate on architectural research globally.

Radical interpretations of the above consideration of research by design sustain that the creative practice is by itself an investigation, that can be considered as a research activity, and implicitly design practice could be a research process. By equating research to practice this position creates confusion concerning the differences between design research and practice. This confusion has been nourished by the wish of academics to bridge the abovementioned schism between architectural academia and practice fueled by two different directions. The first was the endorsement of architectural Criticism as the central core of architectural thinking which, by embodying theory and history, had practice as its main subject. The second direction was the reforms in higher education systems around Europe and the USA, according to which a doctorate appeared a necessary condition to teach in Higher Education Institutions. Architectural academia, under this pressure, engineers forms of academic recognition credits (equivalent to a doctoral degree) to professional practice.

Architectural Research under the scope of Information

If in Architectural research the notion of the system was the cornerstone of its approaches under the scope of sciences and the notion of structure the basis of its approaches under the scope of humanities, the information plays the same role in the construction of the contemporary architectural intellect. By introducing the binary form one/zero, information can cross the polarities between the sciences and the humanities. Moreover, it establishes a common mental environment able to transcribe and describe all the crucial agents that form and transform artifacts, earth, organic life, materialities, and abiotic actors[9].

In this understanding, the building is neither a technical artifact researched by the sciences nor the meaningful encapsulation cultural connotations investigated to be interpreted by the humanities. It is now conceived as the outcome of a morphogenetic process which, through information processing, attributes to its materiality capacities of self-organization and self-adaptation to multiple and dynamic environments (Voyatzaki, 2018, p.12). The building is now 'intelligent' or 'smart', an alive artifact. Its design is directly regulated by the information scripting which supported by the computation, delivers its own generative code, its DNA, from which its form is emerging. The human to which architecture is addressed is no longer conceived as the dominant agent and controller of natural elements and artificial things. It is now located within the natural and artificial environments it created, not recognized as the unique agent who can safely form and transform them. The building becomes an artificial part of the planet the life of which it is invited to assure and protect.

Computers were initially used in the sixties and seventies to assist the architect on rational decision making related to functional arrangements in different design methods. After the eighties, digital tools primarily focused on drawing and representation techniques, enhancing the drawing speed, accuracy, quality,

[9]Cf. Spiridonidis, C. (2019), p. 24-25

and information. In all these cases, they assisted the design process without significantly challenging neither the geometries traditionally used by architects nor the established values at that time. In this collaborative scheme between human and machine, it was clear who is enacting and who is representing.

There is nowadays a radical shift in the role of computation in architectural design. The intelligent machines, that is to say, the machines who can react and adapt to a spectrum of external stimuli and learn how to cope with them can no longer be conceived as the assistant of architectural practice. They can act as the collaborator or a kind of subcontractor, who grants a particular set of skills to be performed and carries out part of the creative process. Architects can convey part of their work to the machine, introducing this way an informal division of labor in the creative process. In this context, the creative act is no longer done by the human but also by the machine and other agents acting and affecting the creative process and its outcome.

The reconciliation of the polarity between the sciences and the humanities that nourished the debate of architectural research in the last seventy years, is in the center of intellectual preoccupations of post-human thinking. The same concern is for other polarities established by the anthropocentric intellect like life versus matter, given versus constructed, mind versus body, human versus nature, immaterial versus material. In his context, the Architect and the machine form a symbiotic assemblage dominated by the embodiment of, at least, two main agents, each one with different intelligence and skills[10].

This new form of vitality which replaces the single architect creator, human and machinic is invited in this new context to eliminate the predefined standards of previous forms of computation and to be open to random and unpredictable stimuli, providing (design) responses as a creative ground on which new ideas and patterns could be tested and implemented. As Braidoti states (2013, p.26), post-human contemplations are dominated by the investigation of new vitalities keeping them open and distant from any scripted determinism or inbuilt purpose or finality.

We are experiencing a new architectural research paradigm which we can call research through design. In research through design the main focus is not on the outcome of the creative process but rather on the type of affectivity and symbiosis the involved agents can develop offering unpredictable ideas, formations and materialities[11].

Reactive + Proactive Architecture

As we have mentioned elsewhere[12], when the gods in ancient Greek mythology decided to attribute traits to living creatures, they entrusted a pair of Titans to undertake the task. The one was Epimetheus, whose name, in Greek, means "hindsight", or literally the "after-thinker" or 'after acting' or 'reacting' and the other one, his brother Prometheus, whose name means "foresight", or literally the "fore-thinker" or 'before-acting' or 'proactive'. Prometheus attributed a positive trait to all animals and left with his brother the completion of the task. However, as Epimetheus had no ability to proact, when it was his turn to attribute to humans a positive trait, he realized that there was nothing left. Prometheus, very disappointed with his brother's performance but also with his fault, stole from Zeus the fire and from Athena, the Goddess of wisdom, curiosity, and imagination and gave them both as gifts to the humans. He was severely punished for his crime to give to the humans something that belonged exclusively to the gods and that would enable them to observe, imagine, invent, create, use and develop tools, techniques, machines, and technology, but also sciences, arts including architecture.

The polarity between 'proactive' and 'reactive' marks the entire history of humanity and Architecture as well. The development of Architectural thinking has some periods where the view to the future is dominant and some

[10]Cf. Coole, D and Frost, S. (2010) p.8

[11]These agents could be human, computation, artificial intelligence, living organisms, different forms of materiality etc.

[12]Cf. Spiridonidis, C. Voyatzaki, M. (2017, p. 166)

others when thinking of the past is prevailing. As we cross the period we examined we can see that in design research, these two poles are increasingly approaching by the end of the human-centered era to achieve their total amalgamation in the post-human thinking. The two brothers are now reconciled.

When the limits of polarities become blurred, the distinction of well-defined categories becomes a theoretical exercise which in practice loses its clarity and distinctiveness. This is the case of the research by design as a term which characterizes a certain approach to the design research. Possibly due to its popularity, it tends to encapsulate all research activities which incorporate into their expected outcome a 'product' which can be either a design proposal, a guide, a building element or component, but also a statement, a comparison, a test, a case study. We tried to locate the research by design in the panorama of the recent architectural research adventure and to circumscribe its epistemological references before and after its appearance as a research experience. The articles presented in this chapter, follow in their majority, different approaches of research for design, implicitly stating the ambition of the term research by design to cover all aspects of the research practice at present. Either as reactive or proactive, these research cases can make us think about the open question 'what architectural research is.'

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CHAPTER #1.01

LESSONS LEARNED IN THE PASSIVE DESIGN OF SOCIAL HOUSING REPRESENTATIVE OF THE MEDITERRANEAN VERNACULAR ARCHITECTURE

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1. Introduction

In 2014, buildings sector reached about 38% of the final energy consumption in Europe. Residential buildings were responsible about one quarter of this final energy consumption, being non-residential buildings responsible about the remaining 13% (Eurostat, 2016). One of the ways to reduce the energy use in buildings is to consider the implementation of passive strategies in the building design, what leads to a reduction in the energy demand for both heating and cooling (Suárez & Fragoso, 2016). The European Commission has proposed long-term targets for energy demand reduction and countries throughout Europe are introducing a range of policies to deliver that reduction (Sorrell, 2015). Under the Energy Efficiency Directive, Member States have already developed National Energy Efficiency Action Plans setting out actions to reduce demand for heating and cooling (European Commission, 2016).

Bioclimatic passive design tries to reconcile energy saving issue as well as the associated environmental impact reduction with the quality of the environment inside the buildings (Cañas et al., 2011). Even if policies focused on the energy demand reduction have entered into force relatively recently, vernacular architecture based on bioclimatism concepts has been developed and used through the centuries by many civilizations across the world (Singh et al., 2009). Since vernacular architecture was performed by the people as a direct response to their needs and values, these buildings show a greater respect for the existing environment. They do not reflect theoretical aesthetic pretensions and use local materials and techniques, repeating throughout history models which take into account the constraints imposed by the climate (Coch, 1998).

By applying the six main principles developed by the Passive Design Guide for the Built Environment (Alonso et al., 2014) to a selected vernacular dwelling case study, we will prove that some recent relevant achievements in the field of bioclimatic architecture can be considered as lessons derived from vernacular heritage.

2. Methodology. Presentation of the case study

The Passive Design Guide for the Built Environment was conceived as a tool to establish a guidance which enables the achievement of the energy consumption reduction goal in buildings by means of energy demand limitation. By prioritizing the use of passive solutions that take advantage of the climatic and the surrounding conditions, the guide contributes to reach users comfort and also promotes economic savings for them (Alonso et al., 2014) . Although the guide is envisaged to serve as a starting point for decision making in early stages of the building design, it is also possible to observe if these passive strategies were employed in a building already built and, therefore, if the mentioned principles were taken into account for this existing building design.

For this research, the methodology selected has been the second one. That means to make an exhaustive and comprehensive analysis of an existing case study to identify what passive strategies had been previously considered during its design and construction, as well as how these passive strategies have been applied. The selected case study is a set of social single-family houses in Valencia, built in the early 20th century to respond to an exodus of immigrants coming from the countryside to find work in the city. As well as housing the growing rural immigration arriving to Valencia, one of

the main purposes in building these housing estates was to provide shelter for people who lived in places that did not cover the minimum health standards (Instituto Valenciano de la Edificación, 2016). The choice of this housing complex as a case study is due to the fact that it is the only remaining one, of all those built at the beginning of the 20th century with the guidelines mentioned, in Valencia. The characteristics on this building are analyzed below.

Figure 1. Case study street view (InstitutoValenciano de la Edificación, 2016).

3. Discussion of research results

3.1. Main principles in the Passive Design Guide

The Passive Design Guide for the Built Environment proposes a valid methodology for analyzing the applicability of the most adequate passive strategies at any geographical location regardless of the building typology. The six main principles developed throughout the guide take into account a series of previous general recommendations related to the location and the architectural design of the building, which should be reconsidered by their importance in the energy efficiency ("DIS–General building design" and "MET–Improved thermal envelope" principles). Since suitability of a passive system for a particular site depends on the climatic conditions of the location and on its geographical characteristics, different instructions for checking the suitability of the cooling and heating strategies are provided ("CS–Solar heating", "PS–Solar protection", "V–Natural ventilation" and "TA–Air treatment" principles) (Alonso, et al., 2014). These main principles are explained below:

-DIS. Considerations about the location, shape and orientation of the building are decisive for capturing the sun radiation and taking advantage of it.

-MET. The building thermal envelope is composed of all enclosures and partitions limiting living spaces from the outside or from the non-habitable spaces. An adequate design, including layers of thermal insulation and inertial elements, is essential to ensure the efficiency of other passive strategies.

-CS. Only through the different building elements design and composition, it is possible to employ solar radiation as an energy source to increase the interior temperature of the building in the cold months.

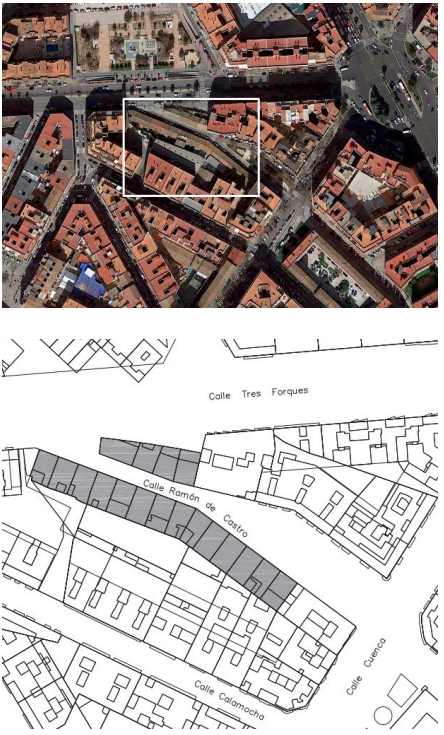
-PS. To avoid overheating caused by an excessive solar radiation, there are several systems whose aim is to protect the building envelope from sun impact, especially in heat periods where thermal gains have negative effects to achieve interior comfort.

-NV. In natural ventilation, air renewal is exclusively produced by wind action or by the existence of a temperature gradient between the air entry and exit points.

-TA. Air introduced into the building can be pre-treated to reduce its temperature or to increase its humidity degree.

3.2. Case study description. Mediterranean vernacular housing features

The housing complex Ramón de Castro –whose name is due to the name of the patron supporting its construction-, was built in 1906 by the Building Society of Houses for Workers in Valencia (Instituto Valenciano de la Edificación, 2016). In a first phase, twenty-five single-family houses were built. Four years later, in 1910, the neighborhood was enlarged with nine more dwellings. At present, only eighteen of the thirty-four houses remain (Traver Monterroso, 2017). The complex is located on the Camino Viejo de Valencia in Patraix, a district located in the southwest of the city (Figures 2-3).



Figures 2-3. Case study aerial view (©Google (2018) and municipal plot plan (Arnau Amo, 2010).

The dwellings correspond to a single-family house on one floor typology. The majority of them have a backyard, planned to avoid easement problems and to make the most of the 120sqm plot. A new concept of housing – different to the rural house- was pursued. The central load-bearing wall, which is characteristic of rural architecture, is eliminated and replaced by two studs, so that the structure does not have an interference with the distribution. The staircase giving access to the attic in the rural house is suppressed, since the house is projected on a single floor, and the vestibule is reduced in size. These changes involve a greater number of rooms (hallway, three bedrooms, a living room, a dining room and a kitchen) where the kitchen is designed independently, without being part of the dining room as in the rural house. The toilet and well are in the 54sqm backyard, attached to the house (Municipality of Valencia, 2013) (Figure 4).

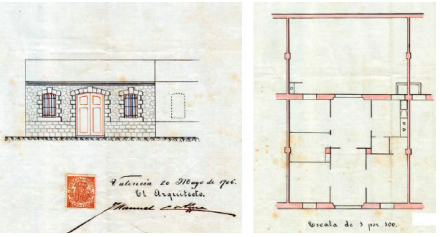


Figure 4. Municipal plot plan (Arnau Amo, 2010).

The Ramón de Castro group is one of the four single-family housing districts that the Building Society of Houses for Workers in Valencia built in the outskirts of the city, and the only one of them that remains.

3.3. Application on the case study of the principles in the Guide

3.3.1. General Building Design (DIS)

The dwellings were built on agricultural parcels, in two opposing rows separated by an inner street as a central axis giving access to all them. Since they are facing each other, some are oriented northeast, while the ones on the opposite sideare oriented southwest. Dwellings are crowded together to achieve thermal protection and to form a dense structure for shading, which shows that it is possible to find in an urban layout the same characteristics and tendencies that have influenced the building design (Olgyay, 2002).

Regarding to orientation, even if the location of some of the houses in the case study is not the most favorable one, a less suitable position can also be improved by taking into account measures for satisfying the other passive design principles. As a matter of fact, other studies indicate that more than a 60% reduction in energy demand could be achieved (Jones et al., 2014).

3.3.2. Improved Thermal Envelope (MET)

The façade walls, which are also load-bearing walls, are composed of a mixed system of mortar blocks on the foundation, limestone masonry on the upper part and a composition of solid bricks in the corners and at specific points such as the jambs and lintels. Mortar and river gravel blocks on the plinth, up to a height of 0,90-1m and measuring 50x20cm, have their joints filled with lime mortar. The total thickness of the façade is about 40cm (Traver Monterroso, 2017).

In this case, the principle *Improved thermal envelope* was applied using massive wall constructions. Massive structures were the most common vernacular dwellings in both cold and hot climates, due totheir ability to store and reradiate heat, and reduceinfiltration by creating a tight envelope. Given the proper thickness, a massive envelope will reverse the temperature inside a dwelling, transferring heat absorbed externally during the day into the structure at night, and then doing the opposite during the night. Examples of massive wall constructions include rubble and earth, wood covered with packed earth, rammed earth, adobe bricks, large wood timbers, and large stone with earth or mortar as the binding agent (Zhai & Previtali, 2010).

The window opening is also one of the most important elements on the thermal envelope, since it is more sensitive to external conditions as the opaque part. Window openings will be analyzed in more detail in solar heating and solar protection sections.

3.3.3. Solar heating (CS)

Solar radiation received by window openings can contribute to decrease heating needs in winter. Depending on the altitude and latitude characteristics of the location, and on the window geometric characteristics, solar contribution through window openings can be an important conditioning strategy (Larrumbide & Bedoya, 2015).

Three hollow compositional axes make up the symmetrical façade (Figures 3-5). The rear façade, resting on the courtyard, follows the same pattern. On both façades, doorways act as fenestration bringing in light and air. The size of windows is related to the nZEB principle of reducing the primary energy consumption (Poggi et al., 2015).

3.3.4. Solar protection (PS)

Although this principle can be generally applied to the building envelope, in this case study the solar protection is focused on building openings (Manzano-Agugliario et al., 2015). Solar protection elements effectiveness largely depends on their position relative to the facade opening. The most effective systems are those blocking solar radiation from outside, before heat penetrates the building interior (Alonso et al., 2014).Solar protection elements adjustable for users play an important role in these dwellings, being both blinds and shutters the main systems employed in this case study (Figures 6-7). They provide, as well as shading, light and breeze.

Figures 5-6. Façade (Traver Monterroso, 2017).

3.3.5. Natural ventilation (NV)

The sloping gable roof houses a space generating a ventilated chamber. Ventilation is due to chimneys and also to small holes appearing in the façade. As well as ventilation, this camera contributes to a betterperformance of the thermal envelope.
The backyard also plays a fundamental role in the natural ventilation of the dwellings.

4. Conclusion

In recent times, from the end of the nineteenth century to later in the first half of the twentieth century, technological advances seemed to eclipse other important long-ingrained cultural phenomena. It seemed to be forgotten that, besides producing aesthetic pleasure and having high authenticity interest, popular architecture provided us with useful teachings. In fact, this is not the first study proving that a vernacular building uses resources which could be considered as valid as or, even better than those provided by other constructing solutions employed currently.
This architecture uses constructive systems with materials such as stone, wood, with a much lower energy cost embedded than the manufactured products. Also, during the demolition processes the impacts on the environment are very low.
The ability of the vernacular architecture to reach the thermal comfort conditions is observed, especially in summer, through strategies of solar protection, heat dissipation and ventilation, without the need to use thermal installations.
For all this, the vernacular architecture presents a great interest, beyond its unquestionable patrimonial and cultural value, with bioclimatic designs efficient and respectful with the environment.

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CHAPTER #1.02

SYSTEMATIZATION AND ARCHITECTURE

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1. Introduction

One of the central issues of contemporary architecture is the possibility of combining the potentialities of industrialized production and the quality of the artisanal work. The first offers the advantages of low budget production on a large scale, but without the possibility of varying the product, while crafts, despite higher costs, guarantees the quality of the specific piece. In general, the process of systematizing architecture allows, along with other advantages, the coexistence and balance between these two principles. The systematization refers to the establishment of a system of order, which aims to obtain a more efficient organization according to the purpose that has to be achieved. Although it may seem a new concept, the question of systematization is not a contemporary invention and has its antecedents throughout the history of architecture. From a few decades, systematization extends to other components of everyday space, such as household appliances and housing installations. In architecture, this concept frequently leads to the use of modules and serial elements, organizing the construction in interdependent processes according to a common principle. A particular contemporary case study is that of Fran Silvestre Arquitectos that has developed the concept of systematization in an innovative way, blending artisan work and advanced construction technologies.

2. The systematization in 20th century architecture

The duality between artisanal and industrial production dates back to the late 18th century when, in parallel to the industrial revolution, architecture began a major renovation thanks to the technologies of iron, glass and other new materials. At that time, the division of polytechnic and fine arts schools was introduced: in other words, the separation between technique and art of construction. The application of the principles of industrial production entails a radical change in the language of architecture and all the other arts. One of the most emblematic buildings of this revolution is the Crystal Palace in London's Hyde Park, built by Joseph Paxton in 1851 on the occasion of the Universal Exposition. The entire project is based on the repetition of a modular structure in iron and glass walls, both industrially produced with great economic and constructive advantages.

In the first decades of the 20th century, rationalist ideas seek motivations in modern technologies and in new materials. Le Corbusier tries to unify building construction and industrial production while looking for the harmonic proportion of architecture. In *Eyes which do not see*, the Swiss master writes that "standard are a matter of logic, analysis and minute study: they are based on a problem which have been well 'stated'. A standard is definitely established by experiment" (1986, p. 131), while in *Mass-production houses* argues that "industry on the grand scale must occupy itself with building and establish the elements of the house on a mass-production basis" (p. 227). The problem of the *house for all* and of the reconstruction after the wars feed the investigation on the systematization and the seriality of the architecture. Corbu himself designed the famous *dom-ino* system (using prefabricated and replicable elements), the aforementioned *mass-production houses*, the *Unité d'Habitation* and the *modulor* system - a formula applicable to all architectural projects, from urban planning to design products (Le Corbusier, 1953).

In 1919 the Bauhaus was founded in Weimar by Walter Gropius. In this new school, painting, photography, textiles, theater, architecture and town planning are taught at the same time, following a new didactic idea based on technological knowledge (Klaus & Bittner, 2017). According to Gropius (1965), the forms of modernity can be reached only through the study of new materials and their production process: "The Bauhaus workshops were really laboratories for working out practical new designs for present-day articles and improving models for mass-production" (p. 53). In addition to Gropius, in Weimar the teachers are - among others - Paul Klee, Vasilij Kandinskij, Marcel Breuer and Mies van der Rohe. As a result of this special teaching system, the Bauhaus students produced objects that synthesized technological, industrial and artistic elements.

In the USA, towards the middle of the century, the architectural panorama focuses on the growing demand for housing by the new bourgeois class. The experiences of *Case Study Houses*, sponsored by *Arts & Architecture* magazine between 1945 and 1966, involved many important architects such as Richard Neutra, Craig Ellwood, Charles and Ray Eames, Pierre Koenig and Eero Saarinen. The aim of the program was to promote an accessible and efficient residential architecture, using new materials and innovative construction systems. Perhaps the most famous of these houses is the number 8 - the Eames House - built entirely with standard production elements, or the number 22 by Pierre Koenig in Hollywood Hills. Although the prototypes were not all built, some of them became fundamental references of modern American architecture, representing the most important experience on the systematization of architecture (Buisson & Billard, 2004).

Another important research, almost parallel but less known than the *Case Study Houses*, was the *Core House* by Mies van der Rohe. In the 1950s Mies develops this *model house*: it has a square floor, available (almost like a car) in 40, 50 or 60 feet size, external glass walls and only four pillars located at the midpoint of the facades. Inside, the walls and furniture subdivide the space (with different configurations) around a central core of services. The systematization operated by Mies eliminates some variables of the house problem: the place is not defined and generically flat, the structure is modular and repeatable, as well as the facades and interior panels, the technological components of house are restricted to the *core*. This room will be the starting point of another evolution of the house: indeed, it could be said that the technology entered the houses through the kitchen.

The systematization of the interior space of the house in the last century is intimately linked to the introduction of electric power. During the 1800s, a commercial application was sought for the discovery of Thomas Alva Edison's electric light bulb, which led to the creation of companies such as *General Electric* or *Westinghouse* at the end of the 19th century. In the first decades of the 20th century, these companies developed a commercial strategy that aimed to reduce production costs by increasing electricity consumption. To achieve this goal, the domestic appliance was created (Giménez, 1995). In any case, the control of electricity and its introduction into homes led to a series of changes in the ways of living. Although it did not happen in the first place with the lighting, it was later, when the appliances began to be produced in series. Appliances led to a transformation of the homes of millions of people on a large scale. At first, the location of the appliances inside the homes was not always related to the kitchen. For example, refrigerators were incorporated as if they were one more piece of furniture, usually in the dining room, but soon they were grouped in the kitchen, altering the layout, dimensions and importance of this inside the home. In 1931 the designer Norman Bel Geddes published a text entitled *House of Tomorrow* in which he defended the importance of the figure of the architect and the changes it proposed in terms of ways of living (Bel Geddes, 1931). A year later his *House of Tomorrow* model appeared, a vision of the house of the future that, with a certain Art Deco style, became an impulse for the architectural streamlining. In the same project he put into practice this new approach in which there was an intermediate room as a dining room, between the kitchen and the living room, and which acted as an element of union of both spaces. At that time, the possibilities

of electricity and household appliances for the organization of life became visible, as well as improvements in terms of domestic hygiene. A concern for developing a better domestic culture arose, which was intimately linked to the ideas of modernity, progress and comfort. The kitchen was integrated as part of the dining room, allowing this interaction between the different members of the family in a more continuous way throughout the time of coexistence. The *Bott House* designed by Frank Lloyd Wright in Kansas City is an example of this union, where kitchen and dining room are separated by a small piece of furniture.

3. A contemporary case study: the work of Fran Silvestre Arquitectos

During the last decades, most of the experiences refer to the prefabrication of the building (Serrats, 2012). In the present, there are several ways that explore the world of systematization of architecture, aligning with past episodes such as electrification and mechanization of it. Josep Maria Montaner (2008), describing the rational architectural system, has identified a "methodological minimalism" - founded on a basic and renouncing architecture - and an "objectual" one - which instead seeks to synthesize all theories on architectural proportion. This is the case of the recent tradition of Mies and other architects like Souto de Moura (Frampton, 2011). Closer to this position, the studio Fran Silvestre Arquitectos has developed its own research in the field of the systematization of architecture. This experimentation establishes work mechanisms with certain parallels to those created from the Taylorist and Fordist models of chain production, but making use of specialized people in different fields in order to achieve excellence in each one of them. In this process, aspects such as seriation and modulation highlight, which are reflected in ways that underlie a deep and meticulous study of the field of geometry. These are the components that together can give rise to certain architectures that aim to the purity of the form through a language that tends to systematize the process. Or, in other words, the search of *efficient beauty (Margagliotta, 2018)*.

A series of forms, or pieces, that, through internal development, give rise to different projects. So there are *types* - or *systems* - that can vary for each design creation: the boxes, the tubes, the trays, the planes, the edges, the curves, the branches, the knots, the masses and the atriums. These systems can be divided into three large groups: basic geometries, complex geometries and repetitions. (Rubio & Camarasa, 2017).

Starting with the first of them, this kind of proposals are born of simple geometries such as the square, the rectangle or the cube. In some cases they overlap and in others are juxtaposed, creating configurations of planes, masses and atrium. Among the projects of basic geometries is the *Water Mirror House* in Calpe, made up of two trays among which the house is located. The second group, that of complex geometries, has different meanings. In some cases it begins with forms from which edges arise in their different axes, resulting in different planes and, therefore, different depths. In others, it emerges from basic geometries such as the circle and the attempt to square it, or from the square and the deformation of its sides. The *Balint House* is an example of this experimentation, in which the exercise consisted of squaring the circle, as well as generating a structure on which to support a concave roof.

Figure 1. Balint House. Source: Fran Silvestre Arquitectos (2014).

The third group, that of the repetitions, is formed by project proposals in which the same piece is repeated, generating an organic *colonizing growth system* - reinterpreting the concept of "urban and landscape minimalism" described by

Montaner. The types called knots or branches are an example of this. The seriation of a single piece allows to develop proposals in which the program can be expanded, as in the *House of the Seven Gardens* or the thermal baths in Alzahara, where a growth system is generated starting from a structure with a curved plant on its longer sides. In addition to adapting to the topography of the place, this system can occupy more or less surface depending on the needs of the program.

Figure 2. Model for the House of Seven Gardens. Source: Fran Silvestre Arquitectos (2016).

Figure 3. Visualization of House of Seven Gardens. Source: Fran Silvestre Arquitectos (2016).

Figure 4. Outdoor Tree Lamp. Source: Fran Silvestre Arquitectos (2016).

Figure 5. Macrocomplex in Qingdao. Source: Fran Silvestre Arquitectos (2018).

The use of these forms has a certain parallelism with the aforementioned "objectual and geometric minimalism", the theoretical research conducted by Mies and the proportioning system encoded by Le Corbusier. As well as the *modulor*, the types used by Fran Silvestre have no scale and are therefore applicable to any size of project. This is the case of the *Outdoor Tree Lamp* (available in different configuration) or of the recently designed *Macrocomplex* in Qingdao. This last project is conceived as a system of aggregation based on the *Mat-Building*, a potentially infinite interior space which incorporates in its genetic matrix the idea of growth, diminution and change.

Systemization does not only involve the formal aspects of the project, but also implicitly regulates the construction system, the materials and the technological solutions. Likewise, systematization is also transferred to the rest of the design process. In fact, these base geometries allow to work according to a modulation, generating a better distributions of the different parts. Furthermore, this process establishes a relationship between

formal coherence, resistant structure and manifestation of the concept of order. The first drawings, which are schematic, attend to a linear layout; once that the program is solved, the technical representation makes possible that every project becomes a built reality. From it, adapting to the aforementioned modulation, the materials are introduced maintaining the coherence with the whole project using the industrial production in series. Thanks to the systematization of architecture, all the factors (from the bureaucratic procedures to the functional requests or the relation with builders) are solved in an effective way. The experience of these built projects trace a trajectory where each work carried out generates knowledge that allows the next project to evolve from previous one, building an open line of research.

4. Conclusion

In 1936 the topic of the reproducibility of the work of art was analyzed by Walter Benjamin (2011) in his famous essay, expressing his theory about the loss of the aura of the work of art (its singularity and uniqueness) versus reproducibility, for example, of photography and cinema. Before Benjamin, Paul Valéry also deals with the subject, writing - with words that are still valid - that "the amazing growth of our techniques, the adaptability and precision they have attained, the ideas and habits they are creating, make it a certainty that profound changes are impending in the ancient craft of the Beautiful". Among the possible contemporary developments, the studio Fran Silvestre Arquitectos has developed its own systematization process, combining in an innovative way the formal, structural and functional aspects of the project. The search for *efficient beauty* is based on the study of simple geometries and their implicitly associated structural schemes; experimentation with the *types* allows a rationalization of the process without make use of predefined or prefabricated systems. In this way it is possible to use the advantages of seriality and modularity - and therefore reduce construction costs - by providing the craftsmanship qualities of each specific architectural project. So systematization allows the convergence of several instances of the project towards an idea - the only purpose of architecture: build space for the human being.

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CHAPTER #1.03

THE CONTROL OF SUBJECTIVITY IN ARCHITECTURAL DESIGN-BASED RESEARCH: THE PROBLEM OF STYLE

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1. Introduction: Some thoughts about subjectivity in design based research

The field of research in architecture in usually split in two paradigms: either the investigation is carried toward technological goals (not contaminated by subjective demands, as aesthetic facets are usually considered); or the approach is purely historiographical, what means that everything is research as long as its focus is in the past.
But, arguably, only the techno-scientific paradigm is capable of producing valuable and meaningful assets into the productive system of our knowledge-transfer-based world, because historiographical research has severe limitations in this sense. But, should it be by renouncing to aesthetics? Or to say it in other words, is it possible to include artistic experimentation in the logic of technical research?
Let's see three possible approaches to this issue observing the role played by aesthetics.

2. Aesthetics as a surplus value

The easier solution to the problem of considering the production of architecture as research is to set apart any trace of aesthetic purpose. This stance was assumed as the genuine form of architecture by different groups of architects in the avant-garde period between wars. Collectively known as "Neue Sachlichkeit" or New Objectivity, its motto in the field of architecture would be well exemplified in Mies van der Rohe's words (Mies, 1923):

"We refuse to recognize problems of form, but only problems of building.

Form is not the aim of our work, but only the result.

Form by itself, does not exist. Form as an aim is formalism; and we reject.

Essentially our task is to free the practice of building from the control of aesthetic speculators and restore it to what it should exclusively be: building.

We reject all aesthetic speculation, all doctrine, and all formalism. Let form be shaped by the nature of the task, using the means of our time. That is our work."

In part this posture was a reaction to the excesses of expressionism and an attempt to reload architecture from scratch, deflecting any critique towards the harshness of their proposals and trying to focus the discourse in progress and technological advance instead of in sterile formalisms. It was quite a bold position, although it wouldn't be too far of what academia values nowadays: true facts. But is this approach acceptable in our eyes?
From the point of view of applied sciences there aren't apparent contradictions; if a new solution is found or a problem is solved, that's it. And only then, if -after solving the functional and technical demands of a problem- some beauty still remains, we welcome it, but it's not our goal. The same could be said of any other technical field: the beauty, simplicity or finesse of a mathematical demonstration isn't sought nor necessary, but we appreciate it. Perhaps, some sort of universal truth lays in those kind of solutions, as a surplus value.
As an example of this cold attitude, we could revisit the work of Buckminster Fuller, whose projects are deliberately deprived of any aesthetic consideration. His goals are purely technological, functional and social, labelling aesthetic aims as distractions, if not hindrances, to achieve the true end of improving design and production processes (Fuller, 1930, cited in Neder, F. 2008, p.15). But this viewpoint leads to a dead-end in this dissertation: if there's no need of considering aesthetics at all, the problem

of architecture as research -as it has been hypothesized- vanishes.

However, returning to the objectives of Neue Sachlichkeit group, which after all were not intruders like Fuller but architects with a classical background, it would be interesting to discover what by-products –if it was the case- could be formed without any aesthetic consciousness. Let's pay attention to the work of one of his most prominent members: Hannnes Meyer. His memo for the League of Nations' competition, held in 1927 in Geneva, replied the committee's request for entries having formal and symbolical representation according to the institution's character, wording quite forwardly this way (Meyer, 1927, cited in Schnaidt, 1965, p.25)

… our building symbolizes nothing. Its size is automatically determined by the dimensions and conditions of the program…

…the building is neither beautiful nor ugly. It pretends to be valued as a constructive invention…

If Meyer's stance here, is intentionally pamphleteer and even politically Marxist, it's not too distant to that adopted by Fuller. On the contrary, we can't say here that there's no formal decisions at Meyer's projects. In a comparison between the two most outstanding projects for this competition - Le Corbusier's and Meyer's entries- Frampton (1968) would say: "*They are both concerned with the direct expression of the requirements in the derivation of their forms and in the arrangements of the complex as a whole*"

In fact, Meyer's proposal is an elegantly well balanced composition in plan and mass; very dynamic, quite anti-classical but arranged to achieve formal order and higher artistic values than what he explicitly acknowledges in his entry's description. His manifesto perhaps would apply more to details than to the whole. As Frampton pointed out: "*The stepped plan profile of the perimeters of these two structures arises largely out of the automatic superimposition of the scheduled room areas on a regular planning grid. The resultant plastic effect appears random and inconsequential*", and concludes by saying: *"The utilitarianism of Hannes Meyer leads to the idealization of the appearance of utility"*

These contradictions between discourse and facts in which Meyer operated were pointed by Adolf Behne, who, trying to delimit the options of this anti-aestheticist current, made evident the need of thinking again architecture as a whole (Behne, 1926):

"The necessary and only sound approach is to reject aesthetic speculation, formalism, and doctrine, but it seems to us quite a frequent error to make this rejection from an anti-aesthetic point of view, even if we inveigh against the aestheticism of aesthetes one hundred times a day. Rejecting aesthetic demands (which is not the same as aesthetic speculation) would be to saw off the branch on which one sits."

Our working conclusion at this point is that a sheer dichotomy between form and content can't be acceptable with all its radicalism, and not only when applied to arts like architecture, but to any other realm concerned with life (Bunge 1960). However, it seems possible to rule out aesthetics from research's initial premises, thus remaining latent, ready to intervene as a counterpoint in any decision-making process, weighing research further beyond practical issues, and finally, intensifying the quality of the product or just invalidating it. Just as Le Corbusier would reject the use of his cherished Modulor if the solution didn't satisfy his sense of beauty (Le Corbusier, 1948, p.183)

"I will fight against any formula and any set of instruments which take away the least particle of my freedom. I want to keep that freedom so intact that at the very moment when the golden figures and diagrams point to a perfectly orthodox solution I may reply: That may be so, but it is not beautiful".

3. Stylistic consciousness

A second option to deal with aesthetics -so deeply rooted in the process of architectural design- would be by defining an a priori style, with specific aesthetic intentions framing the scope of research.

If it's impossible to work with no style, because the absence of style is a style itself, it will be necessary to take it consciously as a datum. Susan Sontag explained this way (Sontag, 1966): *"what is inevitable in a work of art is the style. To the extent that a work seems right, just, unimaginable otherwise (without loss or*

damage), what we are responding to is a quality of its style. The most attractive works of art are those which give us the illusion that the artist had no alternatives, so wholly centred is he in his style".

Bearing this approach in mind, and in order to reduce the weight of subjectivity in research, the most natural stylistic disposition would be a correlation to a zero degree of writing (Barthes, 1967): a reduction of expressivity and a search for neutrality, thus weighing the design process on more relevant facets of the project and developing an appetite for the standard. Laszlo Moholy-Nagy (1928) would say:

"Not the single piece of work, nor the highest individual attainment must be emphasized, but instead the creation of the commonly usable type development toward ***standards****"*

This attitude, quite representative of Bauhaus aims, was brought there under the direction of Walter Gropius, who contributed with his experience with the Work Council for Art, the Werkbund, and his affiliation to other movements like November's group or Taut's Crystal Chain. But, after a short and more radical period with Hannes Meyer as the director of the school, it was Mies Van der Rohe who developed several case-study of artistic-scientific research, which spanned several decades of his life, since the late twenties to his death in 1969.

Among Mies' production, the most valuable set of research is the double series of pavilion-like buildings produced since the early fifties, that begun with Farnsworth's House and concluded with his last work, The National Gallery in Berlin. Along two decades, Mies deployed a repertoire of buildings and projects arranged in two structural families of single-spanned roofs (one-way and two-way structural systems), considering each of them from the smallest size –Farnsworth and 50x50 houses, respectively- to the largest public building –Manheim Theatre or Chicago Convention Centre-.

Mies implements this two series by defining the limits of scale for each piece and consideres the proper changes in structural and visual performances in relation to the size. It doesn't matter if the projects come from real commissions or are purely theoretical, the research demands a full completion of the series.

The formal logic –its style- is the same for the two series. It derives from an attenuation of typological aspects (particularly the correlation between spaces and functions is loose and lacks commitment) focusing primarily on constructive logics and its coherent form, according to the scale of each intervention. Style is based on tectonic rules: clarifying what is structural and what not, and seeking the limits of strength in beams, links and materials of each structural system. Clarity, objectivity and inevitability of each solution is emphasized. Clearly, it sounds like first rate science research.

Of course, even in this path of well-defined style and constructive rigor, other decisions, like the proportions used, relation to site, or practical solutions given to functional needs, depend greatly upon the eye of the architect -and his classical background in this case-, but the zero-degree approach pervades the work conveying an appearance of exactness.

The series produced by Mies are almost complete, in the sense that if we tried today to intertwine new projects in-between, probably it would be a futile and formalist exercise of Miesian rhetoric, perhaps credible as a theoretical or academic exercise, but without the necessary depth of historical sense, what would corner us again into an historiographical approach.

However, it's highly valuable this method of research followed by Mies: working on well-defined series both typologically and constructively; essaying different scales, purposes and siting, to experiment, as in Mies' case, relationships between growth and form (Thompson, 1917) (Neumeyer, 1991) handling quantitative paradigms like the own weight or the analytical-numerical (Casqueiro, 2001); all of this counterbalanced with the visual sensitivity derived from the application of a zero-degree tectonic style.

4. Holistic technocratic approach

The third and last degree of implementing aesthetics in design-based research is quite simple in explanation but very complex in

execution. Implies a thorough parametrization of any aspect of a project, not cutting apart aesthetic or cultural demands from those easier to see objectively like functionality or technical performance. This would mean to consider architecture as a first rate science. But, is it already possible?

A proto-example of this approach is the case of Finsbury Health Centre, by Tecton, built in 1936. This project was developed as a multi-level research, redefining every long-established process of design (Marquez, Cascales, 2006): by de-briefing needs, establishing collaborations with facilities or structure specialists like Ove Arup, or even considering psychological responses of future patients, trying to control every single variable of the equation. In such a complex process, the work in multi-disciplinary teams with continuous feedbacks was key, the same way it happens in any group of tech research, or in today highly developed studios of architecture (Foster & Partners and the like). In these practices, the degree of specialization of their crews and a thorough process of decision-making could be assimilated to a laboratory of science, in the sense that the track of any single step can be followed according to standard research procedures.

It seems that a full parametric control of the process, by means of big-data analytics, looms on a not too distant horizon. Although being it the natural tendency in which scientific method advances, absorbing each time more human activity fields formerly tagged as non-scientific disciplines (yesterday, anthropology, psichology, or economy; today, sociology or history, perhaps tomorrow, ethics and aesthetics (Bunge, 1960)); however, this method doesn't seem ripen enough as to be capable of handling the vastness of data still computed inside the box. Indeed, it would be a poor advance to misjudge as scientific research what is no more than good practice of architectural production (Díaz, 2006). Thinking outside the box, rising standards -and recording the processes as well- is a necessary step towards that change of status in the scientific community, but even more important is the definition of the scope and the cultural context of the project: it is, the relevance of the investigation in a broader picture.

5. Conclusion and methodological proposition

From these different ways in which we can understand the project as an empirical research, stands out a strategy quite pertinent to be applied in the iterative processes of qualitative data so quintessential to architecture production: the case-study.

We've seen the perils of trimming aesthetic branches, what lead us to a dead end of non-architecture; and the naïveness when under the semblance of research is little more than good practice. Both poles have positive elements for the advance of our discipline in academic research, but the example of Mies with his clear stylistic consciousness and typological determination for essaying series of prototypes, proves to be next to the Valhalla of science.

Thus, within this epistemological frame of a case-study procedure applied to architecture, the secular dichotomy between method and typology (Rogers, 1969) would tilt initially towards the latter, starting the case-study always from architectural types whose essential traits (structure, space, purpose,...) should be well defined. But we say initially, because the character of empiric investigation and will of creativity in which an artistic field is founded, shouldn't be confined by any disciplinary or traditional convention.

To conclude, the concretion of an aesthetic will –the style- in architectural scientific production is a sine qua non condition for mastering the kind of synthetic approach so consubstantial to our practice. This style should be defined at the same level than the rest of hypothesis and procedures that frame the object of the investigation. And is this exactness of scope and content what makes the difference between the mere practice of architecture as a profession and a sounding research far beyond the well-trodden ways of historiographical or technical research.

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CHAPTER #1.04

TEACHING PRACTICE AS RESEARCH. THE CASE OF THE 'DUTCH ACADEMY' IN THE 1960'S AND 1970'S

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1. Introduction: research teaching?

According to the International Union of Architects (IUA), the architect's education, and therefore the training of future professionals, constitutes one of the greatest challenges for the built environment and its environmental, patrimonial and cultural balance. Universities and training centers have the responsibility to improve the theoretical and practical training of future architects to enable them to meet the expectations of 21st century societies. Likewise, it strives for methods of training and learning that are varied, so that they enhance the cultural wealth and allow flexible study plans to respond to the demands and requirements of customers, users, the construction industry and the profession and being aware of the political and financial motivations that cause these changes. Therefore, it is convenient to promote debate, reflection and research of these issues among teachers and students of the most diverse institutions and schools.

Most of these debates are generated around the three spheres that form the activity of every school of architecture: profession, teaching and research. These spheres are usually associated in pairs. The profession-teaching axis links the classrooms to the real world of construction, which is increasingly a minority among younger professionals. The profession-research axis is conveyed in two ways: either with Chairs and the design of patents; or incorporating the organizational structures of the offices to the research groups. This does not occur with the teaching-research axis, or what could be called: "teaching practice as a form of research". The investigative dimension of university teaching staff is increasingly being promoted, although it is not always clear that their main task is to train. Thus, this axis could link teaching with various forms of parallel research. This leads to the possibility of improving current subjects, formulating new ones, improving study plans, working on research projects of pedagogical studies cases, or organizing training seminars for future teachers.

Likewise, reflecting on the teaching of architecture and urban planning means starting from the basis that these disciplines are transmissible and theorectic. In addition, similarly to what happens with any research, teaching also complies with, from a background of objectives that through a methodology leads to conclusions, which in their case are verified with the understanding of certain skills. These processes inside and outside of the academic world must be regularized and planned, since in many cases they have been left out of the implied learning. Moreover, they should revert to a teaching practice capable of consolidating not only certain competences, but also promoting research that goes well beyond the classroom. The training thus understood can become an investigation on matters crucial to the discipline. The most celebrated teaching practices in the recent history of architectural education have been set forth in these terms, as laboratories for reflection and action on crucial issues for the practice of architecture, both related to the world of construction, as well as that aimed at theory, criticism and academia.

2. Recent publications

Apart from the publications exclusively dedicated to the education of the architect, such as *The Journal of Architectural Education*, in the last decades there has been an increase in the essays and texts that reflect on the pedagogy of architecture. Framed in this context is Peter Buchanan's article: "What is wrong with architectural education: almost everything", published in *The Architectural Review* (1989).

Thirteen years later, Buchanan takes up the speech again with the article "Rethinking Architectural Education", in a special edition of the same magazine, dedicated exclusively to educational issues. Surprisingly, the diagnosis of the state of teaching does not vary greatly despite the passing of time. Buchanan points out the disconnection of the academy and the profession as one of the endemic evils of the university. In the same issue interesting texts by Beatriz Colomina or Will Hunter can be found. Other journals specialized in architecture, but not exclusively in teaching, such as *Volume and Field*, also hold, on a regular basis, open debates about the training of architects of the future and their relationship with other areas linked to the transformation of the inhabited environment, culture and politics.

Along the same line, with the turn of the century, numerous publications have appeared that gather the traditional and didactic teaching on a global scale of several important institutions related to the training of architects. It is important to highlight the case of Yale School of Architecture (Hayes, 2007) (S. & S., 2016) or the Faculty of Architecture in the University of Porto (Faria, 2014). Other volumes gather the history of what was the regulated training of architects in North America, United Kingdom and *Architecture School: Three Centuries of Educating Architects in North America* (Ockman, 2012), *Radical Pedagogies: Architectural Education and the British Tradition* (F. & H., 2015), and *Architectures manifestes: Les écoles d'architecture en France depuis 1950* (L. & M., 2018). In a more global and contemporary character is *Educating Architects*: *How tomorrow's practitioners will learn today* (S. & C., 2014), with important contributions of teachers and professional from all over the world. In a closer context, Rafael Moneo's course plans from the 70's were recently published in the Architecture School of Barcelona (Moneo, 2017). The extensive volume, prefaced by Moneo himself, helps to understand what the teaching history of the ETSAB (Architecture School of Barcelona) has been.

3. A case of study: the 'Dutch Academy' (1960-70's)

Scholarly context. Analysis and findings

There have been very few moments in history that were as productive in creating a collective imaginary on happiness as the decades after World War II (Wagenaar, 2011). In the context of western Europe, this imaginary was brought to life through the Welfare State, based on public policies of social protection that ranged from the health system to education and particularly, housing. The Dutch society was no stranger to this global trend, and during the post-war period, a change without precedent took place in quality of life standards as well as the perception of social and economic development of the country. The indicators left no doubt, the developmental optimism of the 60's predicted a population growth of twenty million by the year 2000 and the increasing motorization of the Dutch society meant an increase of 500% in the number of trips made in just one decade. The urgency in urban development in the Netherlands converted the housing sector which was very much industrialized and institutionalized into the spearhead of the Welfare State in the country and turned the architect into protagonists of the new consumer society.

Figure 1. New Faculty of Architecture by van der Broek & Bakema Architects Community (1970). Source: www.Broek&Bakema.nl.

The architectural studies at the Delft School during this period differed greatly from the ones of today, both from a methodological and content point of view. Firstly, the building of the School was located next to the Oude Delft canal, in the city center of this university city. The facilities were not able to hold more than 40 students, which is why teaching was more personalized and was carried out from lectures and workshops led by long-term teaching staff (van Es, 2016). In the1960s, access to higher education was widespread and social classes which were economically excluded from this type of technical training were now able to access architectural studies. As a result, the classrooms underwent a massification process and the university as an institution went into crisis.

During those first post-war years, the teaching team of the School of Architecture was divided into two ideologically opposed factions: on the one hand, the traditionalists, led by JM De Casseres (1902-1990) and on the other, the modern ones, with JH van den Broek (1898-1978) at the head. The so-called traditionalist architects took the first courses of the studies in such a way that the students did not encounter modern architecture until the third or fourth year. With the aim of breaking this dual dynamic in the teaching of architecture, professors such as Aldo van Eyck (1918-1999) carried out vertical courses in which students with different levels of training shared a practical workshop on current social issues. Although van Eyck came from the School of Amsterdam and had a critical position regarding the role of architecture in general and the architect, his vertical workshops were related to the social reality of the moment and implied a teaching model for revolutionary movements lead by students in Delft at the end of the 1960 s.

In 1968, two international events put the power centers of the West in crisis, on the one hand, the protests the Vietnam War in the United States intensified and on the other, the student uprising that took place in France in May. The Dutch university centers knew about this convulsion and international change, and these events sparked a revolutionary phenomenon that would later be known as the *Delft Spring*. On May 9, 1969, the students of the Technological Institute requested access to the General Assembly with the objective of forming part of the decision-making bodies of the university, from which they had been excluded (Radical-pedagogies, 2018). To date, decisions on architecture studies were taken by long-term faculty members through meetings behind closed doors. In response to this lack of transparency in the management of the university, the students took over the faculty. The students movement demanded the "democratization" of the university, but this democratization was not limited to the participation in the universities administrative structure on equal terms with the teaching staff, but it also revendicated the right to participate in the creation of study plan content, and in so doing made the academic careers and the training of future architects more flexible. To test these proposals, during the summer of 1969 and the following fall semester in the Delft School, numerous debates were carried out about the role of the architect in society. Workshops were organized based on the teaching model that Aldo van Eyck, who since 1966, had introduced in his vertical and transdisciplinary and social courses.

4. Pedagogical and researching approach

In March 1970, a group of students that belonged to the historic association Stylos published a 120-page manifest titled "*De Elite*" which analyzed the development of the teaching methods in the department of architecture in the Delft university as well as the architectural practices in capitalist societies. The manifest defended an architecture at the service of society, where priority was given to social issues instead of constructive ones. "*De Elite*" also criticized teaching staff members who were originally thought of as allies (Radical-pedagogies, 2018), like Aldo van Eyck or Herman Hertzberger, considered architect-artists whose designs distracted society from real problems. For the Stylos the Delft Spring was in vain since the movement for "Democratization" had fragmented a teaching model focused on self-realization and co-operation and the bourgeois principles of adaptation and competitiveness had not been overcome.

In this context of academic crisis, a mediating figure appeared among the traditionalists, modernists and revolutionaries, that took advantage of the socio-political situation to bring to architectural and teaching practice the democratic principles that formed part of his open society model. This figure of consensus would be the architect and professor Jacob Berend Bakema (1914-1981).

Bakema was a professor in the Department of the Architecture School of Delft between 1963 and 1981. In his first lesson, titled "Towards an architect for society" (1964), Bakema put in crisis the reconstruction plans of the country that were carried out under the principles of the Modern Movement after the Second World War. For Bakema, teaching architecture did not make any sense unless the architect's responsibility for the impact of the built environment on society was accepted. The social themes were the focus of Bakema's teaching activity, but if one theme was to stand out in his professional, personal and teaching career, it was, without a doubt, his commitment to "social democratization" (Ibelings, 2000).

Bakema was always a political activist in search of "true freedom" and "democracy" (van de Heuvel, 2017). In fact, he expressed the will to turn his students into agents with the power of decision making. His biographical background was testament to this commitment. Bakema was imprisoned by the German army in a deportation camp for trying to escape to England during the Second World War and lived in hiding with his family in his hometown of (Groningen) until the end of the war. For Bakema, freedom implied the right to choose a way of life and the ability to develop individual personal skills in society, in this sense, the built habitat could not be indifferent to this will. Democracy for Bakema was the political and social mark that accepted and integrated diversity (van de Heuvel, 2017). Ultimately, architecture and urbanism are related and as a result should give the individual the ability to choose, that is, it should include criteria of flexibility.

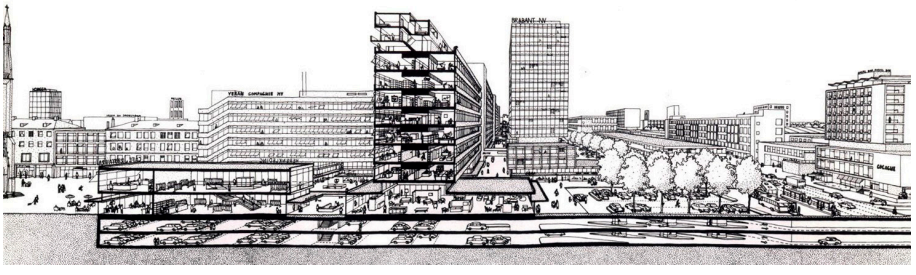

Figure 2. Centrumplan Eindhoven, van den Broek & Bakema (1967). Source: Beeldcollectie, Regional Historisch Centrum Eindhoven.

Bakema's socio-political ideals on democracy and freedom were not alien to his architectural work nor to his teaching practices. The office of van den Broek & Bakema was democratized becoming a "Community of architects", where there was considerable acknowledgement of the rest of the team members in an environment where the designers and builders, architects and engineers, worked together in a non-hierarchical way (Ibelings, 2000). At the end of the 60's coinciding with the Delft Spring, Bakema experimented with the concepts of diversity, flexibility and democracy in the Ordinance Plan of the urban center of Eindhoven.

The first proposal for intervention was based on a ten-story lineal superstructure measuring 400 meters in length that connected different public spaces and uses in the historic center and was rejected by different local social groups. In 1969, the office of van den Broek and Bakema began a participative process in the city with exhibitions and debates to educate on the objectives of the proposal in which a model scale of 1:20 and explanatory diagrams were used. Paradoxically, despite being approved by 20 votes in favor and 7 against by the Town Council, the minister of spatial planning declared it unfeasible due to the high level of flexibility of the proposal which made it unpredictable.

From a teaching point of view, Bakema promoted collaborative work among his students and his preferred way, in his regular classes and collaborations with other international universities, was in the design workshop. The workshop enabled him to deal with current themes intensively and in a short period of time. In Barcelona, he proposed the remodeling of the Santa Caterina Market, in the historic center. His presentations were very visual, simultaneously reproducing both the videos of his trips and slides and diagrams (van Es, 2016). He used the same materials in his television program on urban development "From doorstep to city" (1961-1963), addressing the Dutch laymen. Bakema's democratic social vision implied citizen participation in the design of the built habitat. In this way, the training of the architect and the society in general were aspects that centered the intellectual activity of Bakema throughout his professional and academic career.

5. Conclusions

In short, Schools of Architecture, with its shortcomings and contradictions, must be a university environment; being open to reflection, confrontation of ideas and contact between all those who aspire to broaden their point of view and increase their knowledge in that discipline. The Schools must assume, now more than ever, the role of the nuclei of cultural resistance since no other institution can fulfil this task. The School cannot be left out of what happens in the professional field. But, instead of accepting a subsidiary and limited condition to be an instrument of the professional framework, it must be constituted at a crossroads, in a space of debate.

It was precisely the building of this space that was one of the driving forces behind the important academic and educational changes in the 60's on a global level and especially in Europe and in centers such as the Technological University of Delft. At that time, the revolutionary social movements demanded a greater democratization and citizen participation on the spaces of power. In this sense, the practice of architecture and urbanism were not indifferent to these demands since they directly influence the built habitat. Thus, the democratization of architectural practice necessarily involved increasing the participation of the individual in the definition of their environment, but also by providing the architect with new design instruments based on adaptability and flexibility. The social sciences definitively entered the Schools of Architecture, where these democratic principles; from interdisciplinary, cross-cutting and co-operative design workshops were experimented. The workshops of architecture and urbanism then became true laboratories not only of teaching, but of research and social transformation.

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CHAPTER #1.05

THE EDUCATION OF THE ARCHITECT: LEARNING FROM THE BLACK MOUNTAIN COLLEGE EXPERIENCE

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1. The Contemporary Education of the Architect in Spain

The academic training of architects requires, at present, new forms of approach and confrontation to a reality that is increasingly complex and in constant transformation. Added to this is the fact of seeing the offer of Undergraduate and Postgraduate programmes multiplied, through the large number of Architecture Schools that have proliferated in Spain in recent years (Gutiérrez et al., 2018), and whose study plans do not guarantee a better training (Moneo, 2007). This situation is also affected by the economic crisis and the high labour precariousness in our sector that has led to the emergence, among others, of the SARQ, the architects' union, and that, consequently, the need for continuous training has been generated for the architecture student. In other words, students are obliged to prolong their studies, in order to strengthen their curriculum and compete in the professional market, rather than with the objectives of expanding and deepening their knowledge, as Manuel Gallego (2007) clearly states.

Faced with this situation, the debate on the transmission of knowledge and teaching strategies that was opened years ago is still not, much less, limited. In this sense, the University plays a decisive role as an educational environment where, to a large extent, the architect's training process is developed, which must provide significant learning value for life, both as part of citizenship and society as well as professionally. We must start from the differentiation between education understood as training and the learning process. If we assume that the University does not teach, but insists in learning, its role must be to help in self-training of the student through suggestions, recommendations, training routes, etc. from an active learning where the student grows intellectually and accumulates academic experiences. On the other hand, the learning of architecture is produced from the personal vocation, but not exclusively from this. It should be understood as a process based on particular experiences that are gradually established in each of the students, enabling their individual consolidation within schools, as stated by Santiago de Molina (2015). In addition, for too long, the teaching of architecture, including that of architectural design, has been eminently theoretical. The Bologna Process, in view of the imperative need to adapt the professional profiles to the demands of the labour market, came precisely to try to reinforce the practical load of each and every one of the subjects taught. But these practices remain, mostly, with a foundation (Composition) or without (the rest), theoretical, so that one of the main shortcomings perceived by architecture students is their poor practical preparation.

The situation of architecture in Spain is complex because, on the one hand, it actively cooperates in the quality of its "brand", and, on the other hand, it is largely blamed for the outbreak of the crisis; the role of the architect, also polarised between the creative artist and the anonymous member of a collective, or the degradation of the public perception of the profession, equally deranged between the *star-system* and real estate speculation, makes us consider, as teachers, different ways of learning and studying architecture. And, consequently, new and better ways of teaching. Debates that move to the present and future of the Schools of Architecture both in matters relating to educational projects and the training of the architect. Precisely, in this line, the learning of architecture was positioned at Black Mountain College (hereinafter BMC), despite not being an Architecture School but a liberal arts center based on interactive and experiential learning and that, for this reason,

we want to address in this essay as an ideal example to face the endemic problem in the training of architects today and to value how much of its legacy is in force.

2. Education at Black Mountain College

The BMC was operational from 1933 until 1957, when it closed its doors in Black Mountain, North Carolina. As an educational institution, it tried to move away from the traditional conception of most American universities, opting for an educational approach in liberal arts of an experimental nature and with an informal spirit. One of the essential characteristics that marked its identity was teaching in community, understanding life, work and study within the College. On the other hand, the commitment to self-learning put in value the interpersonal relationships that took place, avoiding assessing students only in the context of the classroom, to appreciate talents and personal qualities that were not generally recognised in the most traditional academic criteria. In this way, any activity or work that took place there was understood as part of the educational process and consolidated the idea of community between the faculty and the students.

The BMC defined itself as a coeducational center, non-sectarian, with a high academic level, without racial or religious quotas, without fraternities or inter-university sports. Its organisational structure was democratic and self-governing; everything was chosen by consensus from assemblies in which there was a board of directors, called the Board of Fellows. The institution had flexibility because it lacked a usual set in terms of academic standards and formal requirements, so that teachers enjoyed freedom when proposing different content and teaching methods. This fact, and the different professionals who got involved in this pedagogical adventure, were shaping an educational programme that was mutating according to the different interests, and teachers hired. The students were examined - by external evaluators visiting the center - to demonstrate their acquired skills and knowledge, and modify the teacher-student relationship established among the members of the College (Gilsanz, 2017).

At the same time, there was an effort to integrate different areas of knowledge transversally between the artistic, humanistic and scientific fields, with the possibility of exercising critical thinking, communicating ideas and solving problems through creative approaches. In this sense, the artistic experience was fundamental to the curriculum of the College, so that art appeared as an essential subject for all students, aspiring artists or not, since it was conceived as a means of exploring the world and improving any academic interest.

This approach can be understood as immersion in an educational atmosphere where different types of actions were generated within the learning experience, which made possible an exchange of ideas and knowledge, inside and outside of the classes. These were presented as an opportunity to consolidate the idea of community between students and faculty and where architecture acquired a decisive role.

3. The Experience of Architecture as Radical Pedagogy

In the creative and mythical atmosphere of the BMC, through which great figures of the artistic field of the North American contemporary culture passed, architecture found its place. Architecture was understood as an activity that was directly linked to the position that the College held in relation to learning, taking as a reference the ideas of the philosopher and pedagogue John Dewey, and appropriating his theory of experiential learning (Dewey, 1938). Faced with learning based on memorisation of data or application of selective methodologies, rules and knowledge that only enable the transmission of certain skills, the College opted for learning linked to action, experimentation and experience. In this way, this learning by *doing* was closely linked to this idea of self-training, where the student, responsible for their learning, *took command*.

The teaching of architecture showed a clear proactive attitude as part of the teaching programme, but also of the construction of the educational environment itself. Although

he never offered the total competence of the degree, Ted Dreier, rector and decisive figure in the College, contemplated this possibility (Gilsanz, 2017). Architecture found its place in that artistic context and was adapted to its reality and needs. An architecture linked to the practice that established a direct relationship between project and works.

The relevance that architecture was acquiring in its curriculum was linked to the purchase of the land in Lake Eden, in 1937, where the new BMC campus would be built. From its foundation, in 1933, until 1941, the educational project was developed in the Blue Ridge Assembly, land owned by the YMCA that the College rented. But the transformation, adaptation and relocation of the Eden Lake holiday retreat that BMC officials acquired to establish their new campus, marked the beginning of the *Work Program,* with an evident role for architecture. This programme was considered an extracurricular activity that emerged as a training supplement to the College's own needs, including the economic one. It aimed to contribute to the consolidation of the intellectual framework of the College and strengthen the idea of community by participating in the maintenance of the land and farm it had, as well as in the adaptation of the new campus. The learning of manual work, management and teamwork, was offered to all students of the College, not exclusively to those interested in architecture, with the idea of involving the whole institution, including teachers. The works aspired to make the BMC self-sufficient and reinforced the idea of breaking the classroom boundary, as well as the interrelation between physical and intellectual work. They also had a strong political component that emphasised the democratic principles of the BMC, where participants became aware of workers' lives (Kurtz, 1944).

The *Work Program* was completed with the offer of intensive summer camps, in the wartime, to attract new students from other universities, and where theoretical training was combined with practice (Figure 1). Also with the multiple visits of professionals linked to architecture who came from his opening to know the project and to give workshops as William Lescaze, Marcel Breuer, Walter Gropius, Harry Seidler, Buckminster Fuller or Jose Luis Sert, among others.

Figure 1. Summer Work Camp brochure (detail), 1940. Source: Western Regional Archives, N.C (2016).

In a way, the trigger of the *Work Program* had its origin in the project developed by Gropius and Breuer in 1939 for a new campus. An ambitious project both for the requirements and for the scale, and made up of different volumes connected and located around Lake Eden. In spite of the organised financing campaigns, the dissemination carried out or the exhibition in the MoMA in January 1940, these actions were insufficient for the viability of the proposal, quite isolated from the grounding of the College. In addition, the US entry into the war stopped potential donors as well as the very structure of the BMC, far removed from the conventional model of other universities. After these difficulties and the need to move to new facilities, since the Blue Ridge Assembly did not renew the rent, the BMC asked the American architect Lawrence Kocher to design a new project.

Kocher was a decisive figure in the College, both for his academic involvement and for his management work, becoming a teacher, resident

architect and director of the works of many of the buildings built on campus. Without Kocher, it is difficult to understand BMC's decisive commitment to the teaching of architecture and, more specifically, to modern architecture and its innovative ideas from Europe, to which he paid so much attention from his position as editor of *Architectural Record magazine*. Precisely, he proposed and supported the initiative that the new campus project was designed by Gropius and Breuer, but finally accepted the assignment and presented a new project to be built through the physical effort of the entire community. His proposal, of smaller scale, was composed of four longitudinal prisms that were born from a hexagonal nucleus and from which finally only one was built, the Studies Building. A building where individual study was prioritised within community life, becoming a benchmark work on campus and the motor of the *Work Program* (Figure 2). His architectural proposals were completed with the construction of the Jalowetz House, the Service Building and the Music Cubicle. In addition to theoretical classes of drawing, projects or construction and with the tasks of adaptation and reform of pre-existing buildings.

After his departure, the *Work Program* continued through other professionals, such as the designer Mary Gregory, and even students who took up the baton and developed the work started and performed works such as the Wood Shop and Print Shop, by Gregory, the Quiet House, by Alexander Reed, the Music Cubicle, designed by Paul Beidler, the Minimum House designed and built by students, the Science Building or the Pot shop and its subsequent expansion, executed by Paul Williams.

The *Work Program* took enormous risks. Today we would say that it was, without a doubt, a radical pedagogy that had to face, from creativity, and without safety net, challenges of various kinds, solving problems on the fly, necessarily learning from mistakes, with hardly any financial support to carry out all those essential actions to improve the precarious conditions of habitability and functionality of the campus. It showed, therefore, the ability of the members of the BMC to adapt to adversity, facing them from the collective work. It put in value the true community dimension of that physical and intellectual effort that, by its size, necessarily required the participation of all in a way of doing that positioned architecture as transversal knowledge to all disciplines and, above all, converted it into the axis of the coexistence of the group. It was, in short, a programme based on its educational value and individual responsibility each participant, understanding architecture as a social activity linked to the moment to improve quality and living conditions.

Figure 2. Studies Building, designed by Lawrence Kocher, 1941. Source: Western Regional Archives N.C (2016).

4. Epilogue: on the educational legacy of BMC

Architecture had a constant presence in the BMC, legitimised from its material response to the needs of the College. Through the *Work Program*, the participants approached directly, understanding and putting into practice, the different building techniques and learned from the limitations and laws of each material. It was understood as an important part of the training process, showing itself as an inclusive activity and open to the different profiles and concerns of students and teachers involved, both in the approach, management, organisation, financing and implementation. In other words, architecture at BMC was close to its inhabitants and facilitated that, through the feeling of belonging to this small-scale community, the participants were committed to the educational project of the College. There, architecture was far from utopias, it looked at the present to face material challenges and chronic shortage of funds. It was a self-built architecture combining locally-sourced, materials with other industrialised ones. Yet, far beyond its short-lived material legacy –as many of BMC's architectural works have already disappeared–, that architectural experience must be understood as a collective learning process that came to materialise. It was a process with multiple obstacles and difficulties making it an almost survival task. Notwithstanding BMC's ultimately closing due to pervasive economic difficulties, our objective is to claim the commitment acquired both by the participants involved and by the role of an architecture at the service of the needs of people.

Despite the time that has elapsed and the evident differences in geographical and cultural context, we believe that there are important and interesting concomitants between the experience of the BMC and the already inescapable questioning of teachers and students of architecture today. A teaching that we understand and claim as capital because it re-situates the role that both architecture and architects can and should play today, away from temptations of both media and disciplinary dissolution: an architecture which takes individual responsibility and collective work and places these in the center of the debate and that bets on the principle that doing architecture is the best, if not the only, way to teach and to learn architecture.

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CHAPTER #1.06

THE EMERGENCE OF A NEW AESTHETIC

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1. The response to the aesthetic mobilization; the new architecture of the masses

Walter Benjamin (1991, originally published in 1936), serves as a reference: placing the "images" in the centre of his quest –for political, productive or cultural social order–, it allowed him to formulate the germ of an aesthetic twist or *visual figurative* -Barrera (2015)- through analysing his contemporaries. From Abel Gance, he gathered: *«The language of the images is not ready, because we are not yet made for them. Currently, there is not enough respect, enough culture for what they express»*. Texts are defining our time more and more as *"The Civilization of the image and visual thinking"*-Gómez (2013)-. The contributions to the debate: (1) if conceptual art separated *knowing* and *doing* it was because the importance resided in the idea; currently, in the time of communication the separation is between *seeing* and *knowing*, a consequence of the progressive distance between reality and representation. (2) The abandonment of the mimesis and the saturation of another cinematographic reality that contribute to the construction of *images-time* (noted by S. Krakauer and focused on by E. Morin and identified by G. Deleuze), that allows a paradoxical dialectic between real and imaginary. (3) Which transitions reality from its relationship with the presentation through *prefiguration* that leads the subject to the sublime. Régis Debray refers to it as: We are witnessing *"the video-sphere, the era where the image was easier to produce than speech"*. A statement that confirms the renouncing of the relationship with reality, the word –Melot (2007)- or text, while the visualization adheres to the imaginary, fantasies or ghosts.

Critical method consisted of "going back from abstract ideas to the specific social reality in which such ideas had their roots, currently, the critical method is reversed: moving from pseudo concrete images to the abstract processes that structure our vital life experience"-Zizek (2011)-. Thus, communicability *transmutes* between imaginary and real. New aesthetic experiences re-introduce categories and concepts that germinate into experiences of the senses: enjoyment of an external desire made internal. A transmutation happens between a reality that is either imaginary and real, that makes other approaches emerge: the time of the *real* whose experience is sensed but not verifiable; where the starting *assumptions* disappear in an inclusive conceptual regime of multiple *cultural ecologies*, which reconfigure a new scenario; the *pleasure of disorder*, Castro (2017), or the bonus of enjoying the politics of recognition.

- (I) *Appearance aesthetics*. Re-appearance of systematized assumptions: like the re-ordering of the aesthetic drift, an approach as an instance of openness to otherness; deepening in ethical-aesthetic relations, dialoguing with aesthetic and hermeneutical dilemmas, especially from the communicative perspective and phenomenology. The idea of an event, *aletheia,* is nuanced: it translates communication as a common experience with the world. The proposals of Anne Lacaton and Jean Ph. Vassal for the Palais de Tokyo of 2002, as a place for artistic creation, is a song of freedom that announces an aesthetic between *ready-made and krunch*: apparently industrial, referred, ground-breaking with the previous moulds, but subtle and elitist. Its apparent emptying (with the dripping vermiculite, its structures and facilities seen as innards), project an aesthetic of emergence that invades: informal, austere, low cost, when it is not. Fiction is more powerful than reality (Fictum and factum have the same root); the referred thing overcomes the evident thing; the indeterminate internal erases what is determined externally. An aesthetic that advocates the decadent, half-hearted, raw,

"disembodied organ" as Deleuze would say, that rebuilds the new society.

The 59 social dwellings, of Mulhouse, France, of 2014, link with those in greenhouse format of 1987, or the 23 Housing Units in Trignac; they strengthen these values by delving into the manifest city. We see, a referential transliteration, a symbolization of other territories, a shift of matter and language (aesthetics of scaffolding), which affects the evanescence of the light envelopes of the plexiglass and multicellular panels. In an old shipyard, the FRAC of Dunkirk, combine the new - that simulates "half finished" - with the old and expose their savings. The affirmations in this sense are constant: to *modestly construct the minimum so that it revives, ..., cheaper than to demolish, ..., more sustainable than adding,* they shape a political story around reusing, even in new work. Tectonic informality: high-end, recycled aspect due to its un-embellished industrial materiality that proposes operational programs or training projects. Intentionality manifests: community, culture and semiosis -Eagleton (2006, originally published in 1990)-.

The appearance was already present, although it was trying to hide. Because, "there is no event in the image without the difference between what happens outside and what happens within the image. Only those who believe they are outside the image can be in it". " Only those who see images in the shadows see reality: appearance, surpasses the appearance and transcends it." Seel (2007). The narrative of "beautification" (recycling at low cost), symbolizes the recovery of the scrapped which increase to exchange value. His involvement in neighbourhood activism: conformation of places for people to mingle; –Zabalbeascoa (2012)- in scenarios of multiple encounters, reinventing the city, (ready-made). Oriol Bohigas, (País-17-11-204) highlights: position against advertising and commercial architecture; firm commitment to moral values: settled in their cost-benefit (quantitative) budgets, which offer a surplus value channelled towards the largest possible space (qualitative veiled by the quantitative); and that reveals the value of the previous as a support for the new, the unfinished or the preceding as a useful material for shaping a city: an architecture of abstention. Modifying the conformation of the necessary city; "Everything works", satisfying localized surplus value wishes. And so, the appearance is their social, aesthetic and cultural ideology, which puts in value such endowment of surplus value to the needy classes (debt or redemption), reinstalling them in the world.

- (II) *Relational aesthetics*: it gravitates on institutional criticism, the questioning of the artist-spectator opposition, integrating the "conceptual turn" or accepting reproductions (copies or citations); admitting the tendency to go beyond its limits in search of a "reunification" of life. Ábalos + Sentkiewicz, show us works with a certain political and formal transgression. Debtor of cognitive cartography that deals with a subjective subjectivity, which avoids self-reference to investigate new formal and relational territories with a kitsch substrate. The high-speed train station in Logroño, 2009, results in a fractal, exogenous and transgressive aesthetics as polyhedral tambourines of recurrent aesthetics, emptying the city which it uses as an experimental laboratory. Omitting conventional urban micro-politics to highlight the new ones: pleasure-truth, aesthetic-artistic singularities, production-observation, which produce new categories. With symbolized references: to the City Tower of L Kant, with interiors like the ROM of Ontario, or the Helios House Service Station in California, (Ogilvy & Mather). What has already been symbolized does not reduce the density of political aesthetics.

Relational aesthetics opposed the "present microtopies" (that is, *"socialization of a space in which an aesthetic community of subjects that are related to each other is created"*), the notion of "relational antagonism"; The breaking of institutional boundaries with the expansion of creation spaces lead to a homogeneous community that avoids confrontations and frictions –Bishop (2005)-, combining terms such as community, politics and consent (Rancière and Bourriaud). Its scope: the search for new human relationships, based on dynamic models of escape alternatives to the foreseeable and expanded reification; the social interstice, the state of encounter (situation), in which the

affirmation of a pre-established, autonomous and private symbolic space is avoided. Therefore, the exhibition of the processes of Ábalos, situations and cartographies of time, facing space; as a place of artistic practices that gives a status where privilege is rejected. His works resist normalizing the industrial regime of his work and take for granted the division of inherent work, joining Fluxus, Baudelaire, Guy Debord, or Raymond Hains. As they suggest, disengagement, wandering and precarious influences that are opposed to stable influences, identities and roots. Ábalos is interested in postproduction; to work with already informed and circulating objects in the architectural culture highlighting the fall of originality, because it is more relevant "to produce relations with the world, with the help of signs, gestures, forms or objects" -Bourriand (1998)-. Their projects create a new modus vivendi where they settle and transgress; -Guattari in *The three ecologies* and the rhizome of Deleuze (1980)-. Designing new radicant subjects –Bourriaud (2009)-; a subject in constant negotiation. Because, "today, it no longer seeks to progress through opposites and conflicts, but to invent new sets, possible relationships between different units, constructions of Alliance between different actors" –Bourriaud (1998)-. The park of Felipe IV de Logroño, with its tambourines and tree-lined structure for the MAC contest, Zhuhai Huafa or the Opera House of Shanghai 2017 demonstrate the enormous "*post-utopian*" socio-formal plexus; transiting from that sensible consensus, to current dissent (rupture of a common agreement of the previous social pact). Gambling on the conflict of the various sensitive and simultaneous regimes (Rancière); as different from the sensible and its refusal to self-referentially identify, as they communicate separate regimes of expression –Ranciere (1996)-. Socio-political dimension: in Ábalos *the political of art*; consists of generating new ways to shape the sensible, disturbing the logic of control. New distribution of material and symbolic space: where politics is combined – Ranciere (2005). The political perspective: move a body of the assigned places or change the destination of a place or make visible that which was not permitted to hear speeches where before there was only noise –Ranciere (1996)-. Dissent provides: displacement of dualities (inside-outside, visible-invisible, object-subject), to focus on circulations, erasing of boundaries, or reconstruction of reality and fiction: because, "ideology always rests on a ghostly basis ". Its architecture participates in a complex feeling, displayed in specific objects and terms.

- (III) *"Practical regime of the arts"* (Laddaga: *aesthetics of emergency and laboratory with radicant and relational)*[1] .Under the title Urban Metamorphosis -Arquitectura Viva 205:2018: pg: 38-39- , the Urban Ecosystem proposal is reproduced, winning the competition for West Palm Beach, Florida, under the management of Belinda Tato and J.L. Vallejo. The written narrative leaves no doubt: "*..., the city as a human ecosystem in balance and connected, ..., a dynamic and inclusive place where activities and spaces are interwoven in a functional way and at a creative time*". In addition, the project includes the recycling of an old garage, to be used for innovation, flexible, changing, adaptable and passively conditioned. The graphic narrative, *il va de soi (it is obvious)*: poor aesthetics art updated to *desigual-land art* based on artificial naturalism; braces, textiles, vertical hydroponic gardens and cover, colourful pop, fragmentation of the program, overlapping unequal plants, apparent disorder of the full and order of the empty.

His narrative invites one to change the state of things, transforming them; it is not presented in exteriority, but as spaces of life, research contexts, collective learning, or open-air laboratories. It produces links and connections, about which users are questioned. It does not operate in a different medium, but aspires to generate there, some clear affects. It does not aspire to put in crisis, the trance or the event, but for the action: showing possibilities of existence and co-existence. It is not about making the other visible, but to produce common worlds. And in this, slow time is required where the process is

[1]Other examples, Luther Blissett, the Venus Project and the experimental communities by Roberto Jacoby, the open production by Wu Ming, the collective film La Comuna by Peter Watkins or the rebuilding of the Vyborg library, opened by local artists

relevant. There are no limits or borders. They form filters of a new reality: capturing fragments of information, manufacturing machines or systems with which things can be made, while manifesting unique visions, demanding reflection.

That is what they are, devices for creating stories. Art is liberating because it produces links and meaning, from the "*uncomfortable realization that we are all in the same boat*". Historical conditions: globalization, transformation of work (no longer specialization, but as a team and as a project of fluid networks); the network as an emerging paradigm (there is no outside and inside, only connected nodes); new forms of individuation (we no longer define ourselves by participating in a group, family, community, but in specific networks and projects). Develop a new way of life; that requires unfolding of fiction, of a fragment, a narrative of meaning that makes readable scattered things and organizes them. The architect is a *recombinant*: he gathers networks, establishes alliances, makes deals, constituting cultural ecologies. Its architecture, "fertilizer".

2. An incipient aesthetics of the real

This aesthetic development –Barrera (2018)- and current ideological appeal allow us a glimpse of a new subject of the real, which intermingles reality and pseudo-concrete images; the existence is possible to envisage in a plasma of *time images*, where the feeling for the realms of fantasy prevails or the enjoyment of fantasy images mounted with remnants of truth in the mind (Zizek), on the recognition of reality. This prescribes an additional psychoanalytic aesthetic, based on the specific and therefore sense, that we identify as the **aesthetic of the real**. The architectural collages of Victor Enrich, Justin Plunkett (Design Boom) or Filip Dujardin, provide fantastic proposals between the surrealism of Matthias Jung and the phantasmic inserted with certain decadence. Images-denunciation, that J. Fontcuberta complains about in communication. Brought to life in the observation tower of Copenhagen by the firm Effekt, halfway between the drawings of G. B Piranesi, the utopians, the reconstructive fantasy of A. Rossy, or the paradoxical images of Escher and in which certain fictional derivation of the postmodernism is achieved. Ryoji Ikeda, composer and artist, illustrates the urban transfiguration.

All this only organizes complex collages of previously overlapping images, even those obtained from the video sphere, without real prevalence. The real subject, thinks and conceives with the overlap between this heterogeneous reality (specific) and fantasies (unspecific), taken as a felt reality. The video-sphere combines both and the subject appropriates them as real, without distinguishing when feeling. The image has no defined material support, predominating the virtual, where its foundation is different from the event (real or unreal) in the image, by its connection with those that represent reality and its meaning. A parallel effect to the harassment of fantasies. From the architectural perspective in the duality history / historicity we see two positions: first, those described where the position of the object-instrument of the enjoyment of the great Other is History, being the humble architects servants (organized to be observed by the other); it is the economy of *perversion* –Zizek 2011-, inventing / organizing counter-revolutionary propositions, from a real event: culture as a decision. Second, the work of Bjarke, is in the same register of fantasy harassment, closer to the paranoid-critical process, where the object of the great Other of History, is that it is observed: the unattainable desire to invent metonymic similarities. It represents banalities[2]: a generation of a pseudo-events as a lie disguised as truth, which passes the simple referential metonymies by creative discourses. It is no coincidence that the chief director of WIRED and Netflix, Scott Dadich, prepares a series about this type of creatives, "*Abstract: the art of design*", where this simulation fits. Together with Paula Scher from the famous studio Pentagram or Ilse Crawford, founder of Studioilse, designer

[2]The 8 House complex, in Orestad, invents a justification for folding the block and knotting it. VIA 57 Wets, 29016, refers us to the pyramid. The shipyards of Philadelphia, as a tribute to the navy, curves its facade like a ship. Or the Hualien houses in Taiwan, which fold to resemble the mountains.

and interior designer. It is the transgressive scenery of the British Es Devlin, specialist in giving life to the spaces making use of audio-visual resources in a creative way, which really gives course to an *aesthetics of the real,* in tune with the ideologically described desired works; half reality, half personal cinephile almanac. It is no coincidence, that the world of marketing, tries to take these examples. A. Badiou (1993) –quoted by Zizkek (2011)- distinguishes these two current trends of the Real in one sentence; *mieux vaut a désastre qu'un désêtre.*

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2

BLOCK 2: ETHICS, CRITICAL THINKING AND NARRATIVE IN ARCHITECTURE

INTRODUCTION TO BLOCK 2

NETWORK THEORY: THE PERSONAL IS POLITICAL

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Ethics, Critical Thinking, and Narrative in Architecture[1]

The twentieth century was a century of theory building about the built environment, culminating in narratives that developed ideas about space, human experience, and the social and spiritual role of architecture itself. Theories permeated design work, either consciously or unconsciously. What almost all of those theories had in common was an assumption of their validity based on, among other things, their political neutrality.

It is in the nature of theory to find generalizations, yet architectural narrative, like the foundations underlying many disciplines, is anything but "neutral". As the selections in this thematic block demonstrate, architectural narrative must be examined in context. Above all, to remain ethically sound, it must be framed holistically, engaging both design and critical thinking to provide narratives that engage the user in a dialog of being.

The Personal is Political

Ethical thinking may be defined as a form of social (if not material) equality; of acting according to Immanuel Kant's maxim that rules should be so formulated that they may form a "universal law"[2]. At the heart of architecture and spatial production is the user, as both subject and object of our ethical thinking.

The user is hardly generic. She or he has both a unique and a shared history. The statement "The Personal is Political"[3], which began as a rallying call during the period of second-wave feminism of the 1960s, introduced a new form of critical discourse based on such histories. The phrase expressed a belief that power relationships determined broad-scale social patterns that found their expression on a personal level. Having knowledge of information retained on a personal level – such as individual experiences within a given situation – represented a first step to recognizing those experiences as part of a greater canon, a closer examination of which could lead to the recognition of new knowledge. Downplaying the validity of the personal became a sign of subjugating the experiences of entire groups of people, leading to the call that the personal is political.

Not surprisingly, the 1960s also saw the rise of alternatives to positivist thinking (in which a thesis or hypothesis is presented and tested), through new methods of examination such as grounded theory[4]. Grounded theory allows researchers to use an iterative process to generate theory in fields using qualitative methods: researchers collect data, analyze it and based on the analysis, seek additional data in order to refine both the question and the theoretical implications of the answers. Put another way, the objective "god-view" of research, in which the supposedly neutral examiner holds the key to which questions will be asked and answered, cedes to a less deterministic method, in which the researcher allows a flood of data points to shape theory building.

Grounded theory is frequently used in the social sciences. Its relation to architecture becomes evident if one sees the built environment as a reflection of society, at once expressing and

[1]This article was adapted from: Staub, Alexandra. "Network Theory: The Personal is Political." In *Theorie der Architektur. Zeitgenossische Positionen [Architectural Theory. Contemporary Positions]*, edited by Sebastian Feldhusen and Ute Poerschke, 397-409. Basel: Birkhäuser, 2017.

[2]Kant's categorical imperative; see Weston 2018.

[3]The exact origin of the phrase is unknown.

[4]Glaser and Strauss 1999; Corbin and Strauss 2014.

shaping people's hopes, views, and actions. If one sees data as small dots of information, grounded theory, like much qualitative research, allows those dots to be connected into patterns of meaning. Those meanings, moreover, are not absolute but represent interpretations of findings. Interpreting the meanings of data and formulating broader theoretical implications from those meanings is an inductive approach to making sense of the world, one that often seeks alternative readings. If we understand these alternative readings as having their own legitimacy, then we are well on our way to understanding how our personal narrative can be part of a network of meanings.

What does the idea of grounded theory and its networks of data have in common with ethics, critical thinking, and architectural narrative? To understand this question, it is helpful to examine how theory is created as an instrument, not only for understanding, but also for producing architecture.

The Ethics of Architectural Narrative

If theory is used to inform architectural design, the inverse is also true: design thinking can be used to inform theoretical production. Architectural design thinking trains the practitioner to think both methodically and iteratively. It is this iterative thinking – the repeated loops around a problem, examining various approaches that might be possible, and testing them for a step or two before clarifying a path forward – that are particularly useful when consciously integrating theory into the design process.

Within architecture, one of the greatest tensions remains the question of how to frame Modernism. Historically, Modernism has been expressed not only as an engineering problem (and one of social engineering), but as a quest for creative destruction, where the old was voided to create something new. Modernism was, by definition, permanently forward-looking, yet the movement also had a certain nihilism about it, or as Marshall Berman writes, the quest of the modern created a system in which the bourgeoisie lives to destroy and tear down things so that they can be built anew[5]. It is this constant renewal that has shaped narrative approaches that came after Modernism, giving new sense to the term *esprit nouveau*, even as the theories themselves have shifted their focus. Seen within a larger social context, Modernism, as a tool for design, becomes ethically fraught. Assumed by its proponents to signify something akin to a universal truth, Modernism was in reality a multi-faceted instrument whose nihilistic tendency favored a struggle for power and agency. It is this question of agency that has become troubling in the greater context of architectural production.

The Power to Create

Having agency to determine what will be torn down and what will be created in its place is a political condition. Lawrence Vale provides a clear example in his discussion of Brazil's new capital Brasilia, pointing out that its expressive modernism symbolically tore the country away from its colonial past and into a unique national future, yet paradoxically the capital city's hierarchically organized spaces evince a continued dominance of a ruling class over its people[6]. As such, the modernization of the country in a specific way – and one that has been shored up by the building of a city according to a specific agenda – told the story of dominance and power structures that were closely aligned with a political system.

The avant-garde cycle of creative destruction at the heart of Modernist ideology – destruction that began with the bid to leave the status quo – continued to find its way into theoretical thinking with its quest to shed a stability that was implied in the status quo. Hilde Heynen has explained this trait of destruction as an idealized masculinity: "In as far as modernity means change and rupture, it seems to imply, necessarily, the leaving of home. A metaphorical 'homelessness' indeed is often considered the hallmark of modernity … [and] reinforces the identification of modernity with masculinity."[7] In

[5]Berman 1983, 99.
[6]Vale, 1992: 115 ff.
[7]Heynen 2005: 2.

other words, within the ideal world of theoretical production, the daring nomad is perceived as the avant-garde explorer, with the destructive force needed to overcome what is regarded as *passé* becoming a necessary prerequisite for (or consequence of) moving forward.
In this vein, theory production can be seen as a political act of dominance without ethical justification. Seen through the distancing lens of retrospection, the accompanying debates seemed to be as much about dominating the discourse as about determining its outcome.

Narrative and the Power of Networks

The process of thinking about who we are and how we interact with our physical and social environment empowers us to seek agency to determine our place in the world. If such agency is to be of use to those who create space and design architecture, designers must have both the knowledge and the agency to determine alternatives and set goals for their work. Alternatively, for those who analyze, critique, or otherwise work with architecture or space as a way to understand social paradigms, theory should provide a full set of tools to perform such work and understand its ethical dimensions.
These basic requirements – agency, coupled with a full intellectual toolbox –call for networks in lieu of hierarchy. Networks, coupled with agency, give alternative readings of our built environment a voice, diffusing individual theories' lack of neutrality. Networks allow for a relative position of stability from which contrasting ideas may be further explored. What commonalities are there? How do agendas differ? How can different perspectives coexist or even further one another? Networks allow a structure to be built up supportively, whereas hierarchies in which older thoughts are continuously challenged and disproved (while uncomfortable alternatives are fought off) create structures that must be defended because they are in constant danger of being toppled.

Networks as Ethical Constructs

If one sees theory as the philosophical arm of architecture, it follows that theory, seen broadly, defines the architectural narrative. The more sophisticated instances of architectural and urban design make use of explicit theoretical principles, yet even simpler processes of design thinking involve decision-making based on some set of values or intellectual premises.
Recent texts on architectural ethics, which offer a framework for examining power structures in architecture, uncover the large role that agency and empowerment plays in design and building processes[8].
Langdon Winner's 1980 essay "Do Artifacts Have Politics" presents a tangible example of how decision-making processes and the reasoning behind them have a political dimension that is often left unspoken. Examining how the creation of artifacts has effects and repercussions that an ethical analysis must take into account, Winner cites Robert Moses's decision in the 1930s to build overpass bridges spanning the Long Island Parkways, which connected the city of New York with Long Island towns and recreational areas with such a low clearance that busses could not pass through. The bridges kept the working class, who did not own private automobiles and thus relied on busses, from accessing Long Island's acclaimed public beaches. The bridges themselves appeared as neutral objects of civil engineering, yet their low clearance allowed them to become political pawns[9].
How can architectural narrative, reframed as a network of beliefs and perceptions, keep us from falling into the trap of ignoring power relationships that affect how we shape the built environment? The key is perhaps in the concept of multiperspective perception, a process that begins with the acknowledgement of a diverse set of users and their interactions with the built environment.
I return to a model with which to critically understand space as a series of polycentric

[8]See Barry Wasserman, Patrick Sullivan and Gregory Palermo's 2000 book *Ethics and the Practice of Architecture,* a volume that is organized around ethical "awareness", "understanding" and "choices" as factors of the architect's agency. See also Staub 2017 for a discussion of using analyses of power and empowerment to develop alternatives for design and planning decisions.

[9]The essay was reprinted in Winner 2010.

perceptions that can overlap, but which must always be understood as a sum of many different impressions. If the architectural experience is seen as a sum of perceptions, then there exist multiple, simultaneous realities, of which the mainstream narrative is but one among many alternatives. This understanding of how different realities can coexist allows us to better recognize conventional power structures, and with them the political dimensions of architecture as a whole.

The perception of power structures within the theoretical cannon becomes a first step in breaking through boundaries set by conventional architectural narratives. The second step is to question the binaries and linear hierarchies that so often permeate architectural theory and the process of its creation, through allowing fluidity among groupings, removing existing hierarchies, and re-framing them within a linked network[10].

In the following pages, five articles explore architecture's ethics, narrative, and capacity to encourage critical thinking. "History as a Design Element" explores the "intellectual recycling of theory" as part of a dialog between the past and present. "Rethinking the Historiography of Nineteenth-Century Ottoman Architecture" examines shifting architectural paradigms that are driven by political agendas. "Design and Interpret the Place of Present" studies the narrative of existing conditions, linked to the concept of place. "Cities Without Limits" takes us on a fluid voyage where limits have both spatial and temporal "thickness" that shelters and gives sense while simultaneously contributing to the urban nomad's uprooting. Finally, "Fake Architecture" questions our experience of architecture by converting "nothing into something".

The claim of "neutral" in architecture is a step towards claiming ethical validity. As the following pages suggest, neutrality cannot exist as long as we have different experiential possibilities in the perception and use of architectural and urban space. Understanding architectural theory's lack of neutrality makes clear that many narratives must exist concurrently and as overlapping systems. In a world so steeped in linear hierarchies that threaten to suppress and thus erase valuable knowledge and insights, the acceptance of multiple perspectives that become part of a greater system of understanding is a first step towards a more ethical narrative of architecture.

[10] Jane Rendell has suggested a similar process to subvert hierarchical binary models through staging an "intervention", in which a new term is used to counter existing binary logics. See Borden, Penner and Rendell 2000, 103-4.

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CHAPTER #2.01

HISTORY AS A DESIGN ELEMENT: DIALOGUE BETWEEN EXISTING AND CONTEMPORARY ARCHITECTURE

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1. Introduction. Continuity as matter for architeture

There is a relationship between the past and the contemporary manifestations that directly influences the debate on the design and construction practice of architecture, on its role and destination, on its relating to the complex context of the discipline.
The dialogue between conservation and innovation is still far from glimpsing a horizon of encounter and sharing, today accompanied by reductive theories capable of exclusively proposing the deletion of one of the two factors at play.
The enhancement of the Italian landscape, and more generally European, interpreted through a social meaning, is based on the reading of the culture of places and the denial of a homologated growth of a territory that, in its diversity, expresses harmony, beauty, value. In Italy, an idea of architecture that is not related to the concepts of memory and identity, related to environmental, historical and cultural logics is not conceivable (Gregotti, 1999).
On the contrast between the power of history as a guardian of memory and identity and the architectural project as a means of innovation, Ernesto N. Rogers writes: "The present work serves as a link between the past and the future; it is not a moment of pause but the obligatory point of passage of history from yesterday to tomorrow. The guarantee of the validity of a work of today is precisely in obliging history to pass through new inventions, in such a way that it wouldn't be possible anymore to continue without them when considering the human being's needs to transform them through their unavoidable evolution" (Rogers, 1981).
The paradigm of continuity is an intellectual, as well as a material act in relation to the theories and experience gained within the post-Second World War Italian architectural culture. "The theory - Paolo Portoghesi writes - is that architecture, every architecture, emerges from other architectures, from a non-fortuitous convergence between a series of precedents that are combined through the imagination of a process. A process that involves the solitude of thought and the togetherness of collective memory" (Portoghesi, 1992).
A phenomenon of *intellectual recycling of the theory* that is based and evolves on the terrain of existing theory: be it in assonance, or in dissonance with previous positions. The historical fields and the pre-existences symbolize, in a complete way, the reality and its transformation over time.

2. Methodology. Historical and contemporary architecture: a dialogue in theory and practice

In the binomial continuity-discontinuity, or even, assonance-dissonance, contemporary action proposes itself as mediator between history and elements of the landscape.
The combination of pre-existences and culture of an era represents the link that constantly traces the history of modern and contemporary architecture: the dialectic link between history and contemporaneity, and the theoretical-operational orientations deriving from it, identify the founding elements of the urban phenomenon. The integration between the expression of the contemporary and the footsteps of the past involves design and construction practice and its interaction with the wide and complex territory of architecture; traces in which evident contradictions remain.
The *past* becomes a phenomenon in-itself-concluded, self-referential, non-reconcilable with the present: the disagreement between

existing architecture and contemporary spatiality is amplified by a cultural attitude that, on the contrary, should underline the value of the present precisely because of its dialogue with history. Manfredo Tafuri, in 1991, from the pages of *Casabella*, sees an additional key to understanding the phenomenon, saying that "in a moment of strong delegitimization of architectural languages (...) the legitimation is often sought precisely in the intervention on historical objects" (Tafuri, 1991).

For Ignasi de Solà-Morales, "the contrast between the old and the new would transform, not only as the result of a radical contraposition, but also in the perceptual process within which each of those would establish, mutually, their dialectical meaning in the metropolitan city complex, it would change" (de Solà-Morales, 1985). Architecture represents the *barometer of an era*, the same way as the city represents the *theater of diachronic confrontation of the eras,* a real opportunity for discussion and debate on the redefinition and redesign of the territory.

The history of the places is to be understood in the same way as the history of the project and of the evolution of places: continuity, permanence and history are the engines of the project, elements of a renewed approach to the contemporary. The harmonic continuity of space and places is the key to understanding the semantic value of the *new* with respect to the *existing*. There is no single road: project approaches are many and sometimes they are conflicting, other times complementary.

In 1951, the 8th congress of CIAM was held in Hoddesdon, England, whose theme was the fate of the city's historic core. On that occasion J.L. Sert anticipates a current situation by declaring that the city is born within its public spaces and that in the empty spaces lies the heart of the city, understood as the real urban condition (Faroldi, 2011).

Memory becomes the deposit for the transmission of knowledge and the foundation of the recognizability of places, constituting the essential requirement for the development of a culture. Designing for the addition or subtraction to the memory involves a specific cultural attitude within communication with the pre-existences, inside which the new projects outline the threshold between past and future. The faculty of the mind to preserve and recall memories and experiences constitutes a fundamental element of the individual and collective identity of the city. Identity foresees the ability of a community to remain recognizable, constituting the expression of a civilization and a culture, also in changing times and fashions and in confrontation and contact with other cultures and civilizations (Settis, 2004).

The contemporary project must therefore possess the power to draw upon the memory in order to confirm the identity throughout a substantial activity of the period it represents.

The architectural language, its semantics, are genetically transformed based on some indicative characters of the places, recovering the compositional, morphological and measuring aspects: a valid relationship both by assonance and by explicit opposition.

Old-new theme, conservation-innovation, such terms as Aldo Rossi also affirms, "can no longer be placed only from the point of view of the relationship between old and new (...) but from the point of view of the necessary modification that is produced with each intervention" (Rossi, 1972).

Working in Italy, and more generally in Europe, represents for us architects a simultaneous action of opportunity and responsibility. Opportunity as the constraint of history as an element of comparison in the project action implies an inevitable phenomenon of assimilation and comparison with this legacy, by introducing stimuli and energy into the project. On the other hand, there is the cultural debt, and therefore of responsibility, towards an area that brings with it values and signs of its own DNA.

Faithful to the concept for which the constructed work can constitute a *theoretical manifesto*, the story is accompanied by some images, which identify some works created by the office of architecture EFA_*Esperienze Forme Architettura* (Emilio Faroldi, Maria Pilar Vettori, Pietro Chierici, architects), aimed at translating thought into matter.

Figure 1. EFA_Esperienze Forme Architettura (Emilio Faroldi, Maria Pilar Vettori, Pietro Chierici, architects), Historical Garzoni Garden, Collodi 2005-2007.

An architectural tale that, in diachronic form, starts from the heart of the Italian landscape as a theater capable of hosting, in the hills of the village of Collodi, a cross-section of the territory's history and its identity represented here by the eighteenth-century Historical Garzoni Garden and some artefacts that innervate it: the Villa Garzoni, the Palazzina dell'Orologio, the Bagnetti and many others. The restoration of the entire system constitutes a representative experiential episode, connected to the recovery of a piece of landscape that clearly identifies the value of the protection of architectural cultural heritage in a logic of their exploitation and new usability.
Inside it, there is the Butterfly House, a dynamic and interactive museum where, not only metaphorically, hundreds of flying flowers - tropical and equatorial butterflies - reproduce, live, feed and fly freely in a "garden in the garden" where opacity and transparency blend with the nature that surrounds contemporary architecture, immersed in the historical Tuscan basin.

Figure 2. EFA_Esperienze Forme Architettura (Emilio Faroldi, Maria Pilar Vettori, Pietro Chierici, architects), Collodi Butterfly House, Collodi 2006.

The story arrives in Parma, where inside the Farnesian Palazzo della Pilotta, three installations are exhibited. These installations are able to stimulate a proactive dialogue with the main spaces that host them: content and container are seen as one at the service of the discovery of the other. The Palatine Library welcomes the *decorations, the projects, the drawings and the engravings of the architect Ennemond Alexandre Petitot*; the monochromatic Farnese theatre unveils the *colorful sculptural clothes by Roberto Capucci;* the National Gallery waits for the guests at the canteen exhibiting *Damià Campeny's table triumph.*
At Alberi di Vigatto, there is the Church of San Lorenzo, from the Romanesque period. Its restoration of the entire parish complex, through the joint grafting of a sacred objects suspended between the lightness and rigor of the sign, represents the enhancement of its system, based on the relationship between countryside, avenue and place of worship.
In Salsomaggiore Terme, in the province of Parma, the Art Déco and Liberty flavor find a new identity by means of recovery, functional redevelopment, redesign and urban reorganization of its beating heart: Piazza Lorenzo Berzieri.

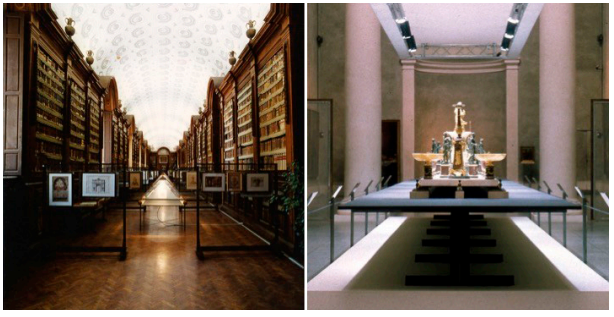
3. Conclusion. Memory and Identity of Architecture

Memory and history impersonate, through decoding contemporary architecture, the invariants of transformation strategies strongly affirming the identity and the image of the Italian landscape: the city and the urban system express the values founded on the inheritance, together with global principle ones aimed at the plurality of contemporaneity.
Buildings, like men, are an integral part of a system consisting of a constantly changing network of roles in the name of flexibility that is expressed in terms of the city's temporal use, an instrument and support for a flexible and contingent socio-economic system, aimed at the definition and implementation of new solutions and control of the future city in full respect of what has been delivered to us by history. "We need to know the history in order

to forget it and be ourselves" (Rogers, 1981), Rogers wrote over half a century ago, with an ability to anticipate the phenomena that makes today's architecture decomposable and interpretable only through decoding of the past, in an absolutely avant-garde logic, which seems contradictory, but it is not.

Figure 3 a, b, c. EFA_Esperienze Forme Architettura (Emilio Faroldi, Maria Pilar Vettori, Pietro Chierici, architects), Church of San Lorenzo, Alberi di Vigatto (Parma) 1993-1994.

Figure 4. EFA_Esperienze Forme Architettura (Emilio Faroldi, Maria Pilar Vettori, Pietro Chierici, architects), Exibition in Palazzo della Pilotta (Parma), Roberto Capucci al Farnese 1996.



Figures 5-6. EFA_Esperienze Forme Architettura (Emilio Faroldi, Maria Pilar Vettori, Pietro Chierici, architects), Exibitions in Palazzo della Pilotta (Parma) Feste Fontane Festoni a Parma nel Settecento. Progetti e decorazioni, disegni e incisioni dell' architetto E.A. Petitot (1727-1801) 1989 and La "Tavola dell'ambasciatore : il trionfo da tavola di Damia Campeny" 1999.

Figure 7. EFA_Esperienze Forme Architettura (Emilio Faroldi, Maria Pilar Vettori, Pietro Chierici, architects), Lorenzo Berzieri Square. Salsomaggiore Terme (Parma) 2008-2010.

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CHAPTER #2.02

RETHINKING THE HISTORIOGRAPHY OF THE NINETEENTH-CENTURY OTTOMAN ARCHITECTURE: ENCOUNTERS WITH THE "WEST"

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1. Introduction

In the nineteenth century, the Ottoman Empire went under significant economic, social, and institutional changes. Accordingly, these changes transformed the social environment and required a new spatial understanding. During the century, new building types came into being, the existing building types were altered, and the architectural language deviated from tradition.
However, until the last decades of the twentieth century, the nineteenth-century Ottoman architecture attracted less scholarly interest in comparison with the sixteenth-century Ottoman architecture. From the 1980s onwards, there has been a significant increase in the number of studies on the topic. This paper aims at rethinking historiography of the nineteenth-Ottoman architecture by addressing some paradigms as determining factors in how the nineteenth-century Ottoman architecture has been perceived in terms of its encounters with the "west." The study suggests that since these paradigms have also mainly been concomitant to current political agendas, intellectual discourses, and philosophical concerns, historiography has continuously changed within decades.

2. Changing paradigms

2.1. 1873

Usul-i Mimari-i Osmani was the first comprehensive study on history and theory of the Ottoman architecture. Being prepared by the imperial command during the reign of Abdülaziz, it was a part of the set of scholarly publications produced for the 1873 Vienna Universal Exposition. The treatise aspired to promote the Ottoman architecture as a unique, rational and evolutionary building practice by introducing the traditions of Ottoman imperial architectural style according to the norms and methods of the contemporary art historical scholarship. Accordingly, the treatise distanced Ottoman architecture from ongoing dissociations of timelessness and inertness of Islamic architecture. Moreover, it defined a cyclical scheme of periodization, which was a common stylistic approach of the time, delineating the beginnings, rise, and fall. In this context, the circle starting with the modest beginnings and culminating in the sixteenth century was defined. The stagnation period was observed after the culmination. Accordingly, the eighteenth century was seen as the period of decline which led to a total breakdown in the first half of the nineteenth century. Then, the revivalist style in Abdülaziz Era was advocated as an evolved contemporary Ottoman architecture. In the treatise, two monuments of Abdülaziz Era, the Aksaray Valide Sultan Mosque, and Çırağan Palace, were mentioned as the forerunners of the new Ottoman style.

2.2. Until the 1980s

Piecemeal beginnings of writing history of Ottoman architecture continued in the early years of the twentieth century. As during the reign of Abdülhamid II, Cornelius Gurlitt surveyed prominent historical edifices in Istanbul and published under the title *Die Baukunst Konstantinopels (The Architecture of Constantinople)* in between 1912-1917. Similarly, in the 1910s, Ernst Diez and Heinrich Glück explored Ottoman architecture in relation with Islamic architecture. However, the nineteenth-century architecture was not a subject of these studies.
Starting with the establishment of the new republic, researches focussing on Turkish architecture gained prominence. Such studies

traced the history of Turkish art and architecture from their pre-Islamic origins in Central Asia down to the end of the Ottoman Period. Accordingly, survey books on Turkish art and architecture under the title of "Turkish Art" emerged. In 1928, *Türk Sanatı (Turkish Art)* by Celal Esad Arseven and *Türk Sanatı Başlangıcından Günümüze Kadar (Turkish Art from Its Beginning to the Present)* by Ernest Diez, in 1946, were published. Both of the books presented Turkish architecture as a unique building tradition. They insisted that different from Islamic architecture, Turkish architecture was a rational building system which did not have excess ornamentation. In the introduction of *Türk Sanatı*, Arseven complained that Westerners viewed the Turkish art and architecture as the Islamic art. Therefore, because Westerners did not distinguish forms of the Turkish art from those of the Persian or the Arabic art, they mixed ornamentations of different Islamic styles and produced a characterless hybrid style. Arseven outlined four periods under western influences: the Tulip Period (1703-1730), Baroque Style (1730-1808), Empire Style (1808-1874), and Neo-classic Style (1875-1930). Among them, he criticized the Empire style, yet, to him, the hybrid style which was the Neo-classic style of the Abdülaziz Period was more corrupt style than the Empire style. He was of the opinion that involvements of foreign and non-Muslim architects to the Ottoman architecture caused the degeneration because they were alien to the Turkish taste and the building tradition. Accordingly, he criticized Aksaray Valide Mosque built by Pietro Montani, as an example of the hybrid style, because of its pediment, gothic windows, and influences from Hindu architecture. Similarly, in 1959, *Turkish Islamic Architecture in Seljuk and Ottoman Times 1071-1923* was published by Behçet Ünsal. He examined architectural forms according to building types chronologically. Ünsal saw the whole nineteenth century as the period of crisis "which the architectural world underwent" (p. 30).

In 1971, *Turkish Art and Architecture* by Oktay Aslanapa and *A History of Ottoman Architecture* by Godfrey Goodwin, in which the nineteenth-century Ottoman architecture was included, came into the scene. By perceiving nineteenth-century Ottoman architecture as a decadent style, Aslanapa briefly discussed the mosques and palaces of the period. Moreover, he claimed Balians who were Armenian origin Ottoman architects, and foreign architects that they were responsible for the deviation from the tradition. Goodwin's study was the first survey book devoted exclusively to the Ottoman architecture. It included a discussion on the nineteenth-century architecture with comparisons between the Ottoman historicist examples and some European buildings. For instance, he compared the façade of Dolmabahçe Palace with the façade of Paris Garnier opera and noted that "it [Dolmabahçe Palace] has the exuberance of Garnier's Paris Opera House but lacks the unity and the force of that masterpiece" (p. 425). Goodwin also examined some western looking features of the Ottoman revivalism and commented on them negatively. *Sanatta Batıya Açılış ve Osman Hamdi (Opening toward the West in Art and Osman Hamdi)* including an extensive discussion on the nineteenth-century Ottoman art and architecture written by Mustafa Cezar was another study published in 1971. Cezar discussed the nineteenth-century Ottoman Art in the context of the westernization. He evaluated the nineteenth-century Ottoman architecture was alienation from the traditional taste of Ottoman architecture (p. 110). To him, the governmental elite who suffered from a "sickness of alienation" was responsible for changing architectural taste (p. 43). Accordingly, foreign and non-Muslim architects who responded to the demands of the westernized taste of the elite were mostly commissioned. Cezar criticized that even mosques were built by foreign and non-Muslim architects as in the case of Aksaray Valide Mosque built by Montani (p. 120).

2.3. The 1980s

The 1980s witnessed the appearance of some comprehensive studies which attempted to situate stylistic transformations and concerns of the nineteenth-century Ottoman architecture within a broader social and political context.

Among the studies of the 1980s, Pars Tuğlacı's

study *The Role Balian Family in Ottoman Architecture* (1981), was the biographical study on the life and works of nine members of Balian family who served as imperial architects. Tuğlacı pointed out that the Ottoman Empire was in decline in both political and economic terms. Accordingly, socio-economic factors should have been taken into consideration when examining the contributions of the Balian family to the Ottoman architecture. Moreover, he commented that since the artistic styles always influenced one another, it would have been unreasonable to expect the buildings designed by the Balian family to remain isolated from the nineteenth-century western architecture (p. 2).

Published in 1985, *Tanzimat'tan Cumhuriyet'e Türkiye Ansiklopedisi (Encylopedia of Turkey from Tanzimat to the Republic)* included comprehensive two chapters on the urban transformation by Sevgi Aktüre and by İlhan Tekeli, and a comprehensive chapter on architecture by Afife Batur. Within the context of socio-economic changes, Aktüre outlined profound transformations which were typical for provincial cities in the nineteenth century. To her, the westernization governed by foreign companies and governments caused socio-economic changes. Similarly, İlhan Tekeli saw urban transformations as a result of the economic changes that were governed by the imperialist powers. In the same vein, Batur discussed that westernization was seen from different point of views by the Ottomans and by the western powers. She noted that the West saw westernization as an instrument for their imperialist policies to the Ottomans. On the other hand, she called attention to that the ideological tendency which overlooked to the nineteenth-century Ottoman architecture as a symptom of the corruption or the collapse should have been rejected; Westernization should have been examined in connection with its effects on architecture.

Remarking of Istanbul, by Zeynep Çelik (1986) dwelt upon the wide-ranging changes in the urban scene of the nineteenth-century Istanbul regarding changing modernizing agendas of the Ottoman State. Çelik argued that modernization of Istanbul was an essential process which aimed to create a western-style capital in both form and administration, symbolizing rejuvenation of the empire. Çelik tried to define Istanbul's place within the framework of comparative urban history. To her, although the city was already conquered by foreign thought and enterprise, Istanbul did not reflect the development pattern typical of colonial cities nor did it resemble contemporary European cities.

Another significant study which examined architectural transformations of the period was Gülsüm Baydar Nalbantoğlu's dissertation "The Professionalization of the Ottoman-Turkish Architect" (1989). It was the first study which exclusively focussed on the institutional and intellectual context of architectural practice and learning during the period in question. By touching upon socio-economic conditions of the nineteenth century Ottoman Empire, Nalbantoğlu discussed the historical conditions of power and patronage as one of the main defining factors of the architectural transformations. She viewed the nineteenth-century Ottoman Empire in the process of cultural and economic colonization by the western world. Meanwhile, Nalbantoğlu pointed out that the non-muslim groups had an essential role in the economic and cultural colonization process as well as in architectural transformations (p. 4).

2.4. The 1990s and 2000s

In the 1990s, there was an increase in the number of studies dealing with the nineteenth-century Ottoman architecture. Comparing with the studies previously carried on, it may be observed that this new generation of studies presented a broader range of ideas and dwelt on more specific questions. Diverse subjects of architecture such as professional institutions of architecture, organizations of construction site activities, dissemination of architectural knowledge, learning and teaching of architecture, representation of architecture, patronage, and contributions of non-Muslim and foreign architects to the Ottoman architecture have been studied deeply.

Displaying the Orient: Architecture of Islam at Nineteenth-Century World's Fairs, published by Zeynep Çelik (1992), elaborated on the representation of Islamic cultures at the World

Fairs of the nineteenth century, with a focus on architecture. Presenting the Ottoman pavilions at the World Fairs, Çelik aimed at discussing how westerners received these pavilions and how western architects reinterpreted Ottoman stylistic traditions. Moreover, She analyzed the stylistic qualities of these pavilions in relation to the nineteenth-century search for cultural self-definition.

Ondokuzuncu Yüzyıl İstanbul Mimarlığın'da "Orientalism" by Turgut Saner (1998) was a study concentrating particularly on the Ottoman revival in architecture in Istanbul. To him, "Orientalism in Ottoman architecture did not originate as fashion which later transformed into a revivalist Ottoman approach. From the start, it was a component of searches to express an Ottoman identity within a contemporary framework" (p. 162) Saner indicated that the Gothic style was transferred to Ottoman architecture with its theoretical background. In this regard, he was of the opinion that Aksaray Valide Sultan Mosque's design revealing the common sources of Arab and Gothic architectural traditions, was a product of the attempts to contemporize Ottoman architecture.

İstanbul 1900: "Art Nouveau" Mimarisi ve İç Mekanları (İstanbul 1900: "Art Nouveau" Architecture and Interiors) by Diana Barillari and Ezio Godoli (1997) was the work gave a detailed consideration on the development of Art Nouveau in Istanbul. According to Barillari and Godoli, foreign architects such as Montani, Parville, Bourgeois, Barborini, Jashmund, Vallaury and D'Aronco made essential contributions to Ottoman revivalism. Barillari and Godoli commented that some existing studies which viewed the involvements of foreign architects to the nineteenth century Ottoman architecture as an instrument of cultural colonization were unfair assessments.

Zeynep Çelik's cross-cultural study, *Empire, Architecture, and the City: French-Ottoman Encounters, 1830-1914,* (2008) focussed on the construction of public space in the French and the Ottoman Empires by situating two empires in a comparative framework. Çelik aimed at dismantling the ongoing understanding of one directional influence of European art and architecture on the Ottoman modernization and showing the existence of complex communication patterns by tracing parallel developments.

3. Conclusion

The history of the nineteenth-century Ottoman architecture has been shaped by paradigms as determining factors in how the nineteenth-century Ottoman architecture has been perceived in terms of its encounters with the "west." However, these paradigms have constantly been reshaped by current political agendas, intellectual discourses, and philosophical concerns. As a result of this endless dialogue between the present and the past, the perception of the encountering "west" and connotations of "westernization" have changed.

In the 1870s, the West was perceived as the modern world of which Ottomans strove to be part. Accordingly, westernization had almost the same meaning as modernization. In this context, the authors of Usul-i Mimari engaged in redefining Ottoman dynastic building tradition as a unique and historical style by responding the pre-establish binaries, "West/Non-west," "historical/unhistorical," of the contemporary art historical scholarship.

Starting from the 1920s, a significant effort was spent on defining and presenting "Turkish architecture" in accordance with the ideological environment of the time. So, the Ottoman past was selectively Turkified. The centuries which were perceived as the periods of "the rise" were praised and integrated into the grand narrative. Yet, attained a kind of foreignness and alienation, the nineteenth century was labeled as the period of "the decline." Moreover, as side effects of "the decline," the absence of national allegiances and the passiveness of the state which led to the collaboration with foreigners were viewed. In this period the encountering west was seen as the foreign powers which dominated the corrupted state. Therefore, regarding the architecture of the period, a lack of authenticity and alienation was perceived. Meanwhile, in the first half of the twentieth century, notions about "modernity" dominated the scholarship also caused that the nineteenth-century historicist architecture was

evaluated negatively. As a result, until the 1980s, the nineteenth-century Ottoman architecture was not studied deeply. However, there were some studies examining surface evidence of western looking façades, yet, most of them were not more than some skin-deep stylistic assessments of the buildings in relation with that "what was appropriated as Turkish" and/or "what was left as western."

In the 1980s, a new trajectory opened to think nineteenth-century architecture within the cultural and socio-economic context. However, the context was framed by a common wisdom about "the decline" of the Ottoman state and the widespread idea that the Ottoman Empire sought its salvation by imposed "westernization." Furthermore, the Marxist analysis of socio-economic conditions and the ideas influenced by the current discourse of Edward Said's Orientalism and by Foucault's arguments of concept of power and knowledge relations in a society, left a little room for the discussion of the active response of the Ottomans' to the current architectural debates and developments in Europe. In this period, "the West" was mostly perceived as the imperialist powers manipulating the Ottoman empire. Accordingly, "westernization" was viewed as the instrument of the exploitation of the Ottoman Empire by "the West."

The period starting from the 1990s has witnessed the studies under the influence of post-colonialist and poststructuralist discussions. The number of the researches digging a wide range of archival material, such as plans, photographs, engravings, pictures, sketches, and imperial edicts, gradually increased. Instead of outlining a general perspective on the period, this new generation of inquiries has elaborated on more specific questions. Focussing on identity formation, cross-cultural exchanges, and orientalism, studies have deconstructed the current rhetoric and challenged with the inherited arguments of the canonical historiography. Reports viewing the Ottomans' imperial architectural program as an active agent responding to the current architectural debates and developments in Europe have gained dominance. While the researches are becoming more fragmented previous Western/non-Western paradigm evaluated the period within two uncompromising categories have faded away.

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CHAPTER #2.03

DESIGN AND INTERPRET THE PLACE OF PRESENT

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1. Introduction

In our time, characterized by the uncertainty produced by the crisis of the foundations and by the superficial culture of the image, recognizing a poetics means to affirm the necessity to make a theory and methodology of architecture. The method, in fact, with its rules and its principles, gives effectiveness to the premises and offers good chances of success in the construction. Through the recognition of a method, supported by the credibility of the construction, rules and principles become communicable and shareable.The reading of some interventions realized by *Margagliotta+Tuzzolino Associati* (both architectural design professors of the University of Palermo) in small towns in Sicily, allows us to outline a method based on the reading and interpretation of existing condition, strongly linked to the concept of place. These are projects of open spaces (which become occasions for the redevelopment of the city), services for the community (which transform logistical issues into opportunities for architecture and the landscape), interventions on historic buildings (where restoration is a pretext to enhance and use memory as a material). In every specific circumstance (whether linked to the city or to the building) these projects affirm the reasons of contemporary language. Architecture pursues a significant and coherent modification of the places, defining a settlement principle that allows to find themeasure and the balance with which the new construction dialogues with the existing matter. The works highlight the typological theme, the spatial meanings and the linguistic values of the context, to which is added the interference with the needs of living. In all cases, then, the themes underlie a larger value than what each project expresses. First of all because of the relational questions that are defined, and also for the interpretation of the project as a form of responsibility towards the man, the landscape, the city and especially the beauty.

2. Reading the existing space

The basis of the design process is the reading of the existing space from which we can proceed towards an attribution of meaning (which sometimes the places have lost, or have never owned) and the intention of expressing the qualities and the value of space (aesthetic and ethical). Another basic reason is the desire to relate the measure of the intervention to the formof the city, as well as to seek an authentic relationship between man and the physical space that he lives in.
The method is based on a well-established theoretical support that in contemporary culture makes use of Heidegger's philosophical contribution (1951), for which the project allows orientation - knowing where man is located - and identification - understanding how the place is made - beyond that of Gadamer (1964) according to which each building is determined, in a dual manner, by the purpose it must serve and the site it must occupy, bringing something new to the urban or natural landscape. In a more specifically architectural context, the method assumes the concept of *genius loci* that reveals and helps to think significant places that help man to live (Norberg-Schulz, 1976), and the ability to see and interpret the places that Vittorio Gregotti in his *Territory of architecture* (1966) idealizes as materials of architecture with the task of giving meaning to the entire physical environment. It is also worth mentioning the principle of the *separating-alloy space* enunciated by Fernando Távora in *A organização do espaço* (1982). With this strategy the project never becomes mimetic and does not renounce to the signs of modernity for which the place,

read and interpreted, listened to and re-invented, is revealed by architecture; indeed, it is properly architecture. And the building that perhaps more than any other celebrates this way of thinking about architecture is *Casa Malaparte* in Capri by Adalberto Libera (1938): "One of the rare cases - says Francesco Venezia - in which the initial arbitrariness of the occupation of an intangible natural site leaves behind a deep sense of necessity. We are no longer willing to imagine Capri without that presence: the house can reveal the truth of the island" (Venezia, 2013, p.55). This topic then refers to the architectural tradition of the Mediterranean area, pure, simple, essential, made of walls and light. Starting from this awareness, today more than ever it becomesnecessary to investigate and read a reality that has become very complex. The spaces of beauty have been reduced and we often feel the need for new beauty (the shapeless cities, the hybrid landscapes, the spaces of contradictions). We must therefore be receptive, become sensitive: opening our eyes is the condition to oppose the distortions that mark the scenes of the city, which corrode the countryside, which destroy the landscape. On the other hand we must know how to understand what is not beautiful: this is the reality that most needs care and caution. To see the world around us means to pay attention to the detail, to the things of nature and everyday life, to the landscapes and the usual spatial situations – "look for the unexpected, the extraordinary in ordinary things", as the painter Balthus suggests - (Pontiggia, 2009, p. 53). The seeing, then, directs the sense of responsibility of recognize how the world is made, knowing how to interpret it and having the desire to modify it to transcend it.

3. The interpretation of the existing place

Some reflections on the works, passing from reading to the interpretation of the existing place, allow us to outline a possible way of making architecture and of verifying the results in the concreteness of the construction. The projects presented were chosen to express the ways in which to intervene in paradigmatic situations in the places that today are offered for modification: the design of an infrastructure in the open countryside in which the theme is the relationship between nature and artifice; two works in which the new construction interacts and tries to give new meaning to the city (the historical one and that of the periphery) united by the idea of control of the horizon; two projects, finally, in which the existing place is a building itself, already with its own history and specific spatiality.

3.1. Water tanks in Cammarata

Starting from technical requirements, the design reaches the definition of a system that,through the orographic conformation of the site itself, on steep slope, highlights the path of water before entering the water network, and its natural transfer into the different phases of treatmentin three different volumes partially buried in the ground. While the first volume of the system is a excavated cube that defines the basic element of the composition, the other tanks consist of pairs of octagonal volumes emerging from the naturalness of a slope that looks at the surrounding landscape. The project's theme thus becomes the conflict between the stereometric geometry of the artefact and the dramatic physicality of the ground. The part of the solids emerging from the ground is only a portion of all their effective volume, as they have been sunk as much as possible to reduce the visual encumbrance in the landscape, but also to protect the collected water. The materials, in their precious definition, enhance the game of the contrast between nature and artifice. The organization and the decomposition of the program into different elements, allows a more careful articulation in the countryside. From the bottom view the buildings are almost like strongholds but, in the opposite direction, they seem like terraces that disappear in the open landscape of the valley with view towards the Etna.

Figure 1. Water tanks in Cammarata. Source: ph. Giovanni Chiaramonte (1993).

3.2. Multi-purpose sports facility in Racalmuto

The occasion is given by the necessity of a multipurpose sports space, equipped with locker rooms, uncovered and covered parking (which also constitutes a walk-lookout path). The building establishes a new urban boundary to seek a meaningful relationship between the labilefabric of the city and the natural landscape visible from the site. Taking advantage of the natural slope of the land, the project develops in such a way as to guarantee the functionality of the system. The space for sports activities, service facilities, stands, connections and parking spaces, are integrated with the site's orography and are oriented towards the landscape view. The rectangle of the playing field is contained within an enclosure, bordered by the stands and by paths that determine views and panoramic walk. On one of the short sides of the enclosure, the locker rooms fit together like two almost hermetic volumes. The roofs of the parking areas define a square that integrates the project with the urban vocation of the site and highlights the horizon line with the countryside, the landscape of the valley, the hills in the distance.

Figure 2. Multi-purpose sports facility in Racalmuto. Source: ph. Author (2010).

3.3. Belvedere at the Castle of Cammarata

The project, included in a vast architectural redevelopment of the historic center, is a square that is also a lookout point. The reorganization of the area with the integration and reuse of abandoned spaces was carried out with interventions aimed at enhancing its aesthetic and functional aspects and allowing an appropriate use of the historicized space and the surrounding landscape. In the area adjacent to the castle's ramparts, each existing element (rock, traces of walls, ruins, pre-existences, altimetric variations) receives a new meaning thanks to the renewed spatial order taking shape of the natural and formal potential of

the place. In order to respect the natural slope of the place, a system of terraces, steps and stairs was adopted, creating a composition of horizontal and vertical planes in which to stop, observe or perceive the possible horizons. The square-belvedere is embedded in the rock with a stereometric box carved in the thickness of which a path reveals the landscape and the city, allowing also the view on the underlying stone steps. This staircase, following the logic of the excavation, reaches the lower level and transforms the void into a theatrical space. The complexgeometric configuration is obtained by reading the alignments and traces of the urban fabric, generating the geometric articulation of the new spaces.

Figure 3. Belvedere at the Castle of Cammarata. Source: ph. Author (2006).

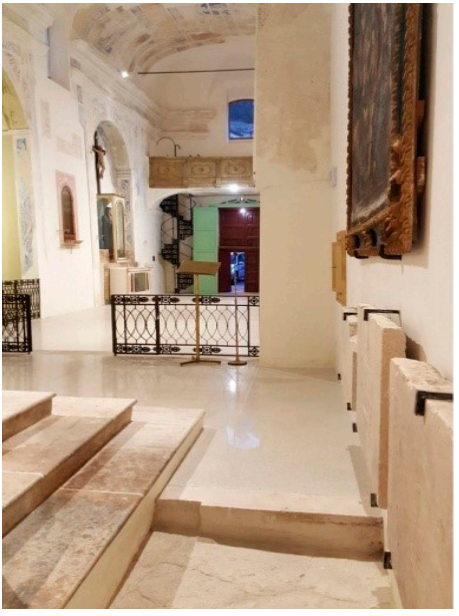
Figure 4. Sammartino house in Ravanusa. Source: ph. Giovanni Chiaramonte (1994).

3.4. Sammartino house in Ravanusa

The design of the house highlights the spatial significance and linguistic values of a nineteenth-century residence, making it interfere with the demands of the contemporary project. The redevelopment of spaces according to current living requirements finds the expressive themes in what already exists and in compliance with the constructional features of the building. Starting from a philological interpretation of the house - a building that possesses the characteristics of Sicilian aristocratic residences - the project makes a reconfiguration with the search for a balance between conservation and transformation, pursued with minimal interventions. On the ground floor the distribution path always opens along the succession of spaces; on the first floor new centralities and spatial hierarchies are defined. The use of new materials gives a unitary image of the house to guarantee spatial continuity or, with the use of material and chromatic variations, exalt the presence of singular elements. The house is based on the coherence of the signs of the past with modern living, formal and cultural needs.

3.5. Restoration of the San Biagio church in Cammarata

The restoration of a church of the XIII century, widely transformed over time, then abandoned and partly collapsed, was accomplished with the creation of a space which itself becomes a document and testimony of memory. The project reveals stratifications of the construction and bring to light different and overlapping decoration cycles. The interventions determine a new equilibrium in which the different decorations coexist, testimonies and signs of different times. The space becomes the unifying element, defined by the flooring, walls and vaults (in some consolidated parts, in others reconstructed). Monochromy uniformizes and determines the purity of the internal volume. The result is a modern spatiality that enhances the fragmentary nature of the memory that emerges with discontinuity, guarded by architecture. This work is linked to that architecture based on the idea of sedimentation and praise of the fragment that has significant references in Sicily in many works by Francesco Venezia (as in the *Palazzo Di Lorenzo* in Gibellina) or in the conversion into the square that Álvaro Siza makes of the ancient *Chiesa Madre* in Salemi.



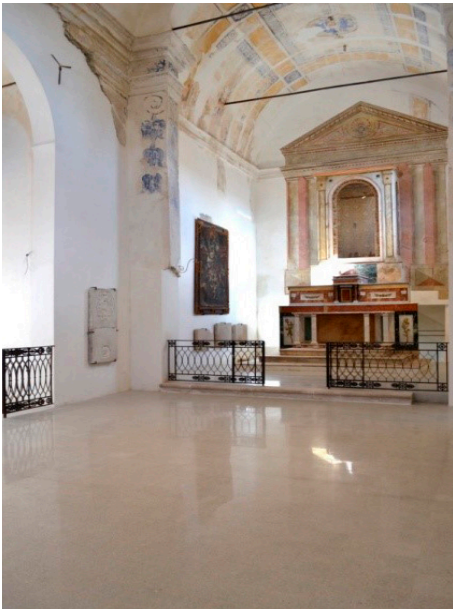


Figure 5. Restoration of the San Biagio church in Cammarata. Source: ph. Author (2017).

4. A possible poetic

At this point, the projects described can be read and interpreted as stages of a research based on the critical reading of the context and on the affirmation of a clear settlement principle. In this sense, architecture is based on the interference of memory and the theme of the place. Each project, in fact, leads to the reading and interpretation of the specifics of the context by operating and "thinking through relationships" (Gropius, 1968, p.17). From the context, the project draws the rules that serve to connect it to the already existing aesthetic and ethical principles. Therefore, every work interprets and exalts a latent spatiality and, at the same time, creates a new regulatory order for specific organizations. The space is defined by working on the idea of continuity, above all with the aid of monomateriality, using excavation and subtraction procedures. In this way, language and gestures are reduced to the essentials to allow the wall, the volume, the light to express themselves as basic materials of architecture. The reduction places simplicity as the point of arrival of the project which, starting sometimes from complex solutions, simplifies until the moment that every element, even the smallest detail, becomes necessary and indispensable to the logic of the project. The essentiality becomes poetic that frees architecture from the superfluousand can aspire to a general principle of beauty, starting from the desire to make it bring out and highlight what already exists.

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CHAPTER #2.04

CITIES WITHOUT LIMITS

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1. Introduction

The city is one of the most sophisticated human creations and, possibly because of this, it is also one of the most uncertain. Taking into account its considerably long history, it might be difficult indeed to attach a meaning of the city.
Firstly, we want to propose an interpretation of the city based on the concept of limit. In fact, this concept is closely linked to its evolution and we postulate in this text that focusing its analysis on it, it's possible to illuminate its historical course. In that sense, secondly, we would characterise the history of modern cities through the idea of limit. Thirdly, and finally, we will see how it is possible to link this way of understanding the city and the idea of landscape, a symptom of urban hermeticism.

2. Limit and Place

In sixth century Justiniano's *Institutas*, precisely in its IInd book Ist title "On the division of things", we can find some clues to deepen into the concept of limit and its relationship to the city. Under Roman law, it is said that things belong either to somebody or to nobody. That is the primary division.
There are three kinds of things which neither are nor may be anyone's property. Those belong to everybody, such as air, running water, and the sea and its shores. They can also be public, thus belonging to the collective, such as the theatre and other public buildings. Or they are things which essentially belong to no one (Justiniano, 1898: 31). Whitin those, there are three types. Things not belonging to anybody are sacred things, such as temples; religious things, such as tombs; or holy things, such as city walls and their gates[1]. Therefore, things not belonging to anybody are those in which our own existence transcends (Jiménez-Redondo, 2014: 61). In other words, humankind recognizes in those things a *limit* beyond which their existence no longer holds, either referred to the gods as in the case of temples, or to death as in the case of tombs, or to civilisation's boundaries as in the case of city walls and their gates. Beyond those things that do not belong to anybody, existence cannot take *place*.
Among city walls, fortifications and gates, those holy things which belong to no one, one thing illustrates with special clarity what is being discussed here. During the first and second century, Roman Empire was largely stabilized, that is, its borders were largely fixed. In order to consolidate them against "barbarian people"'s threats, colossal walls were built. They called them *limes*.
Those *limes*, such as the one built by Hadrian in the North of England, Roman province of Britania, was a complex system of stone walls, forts and gates that pulled apart Roman Empire with the rest of the world. Therefore, the *limes* indicated Roman Empire's *limit*, sort of. However, this *limit* is different to the contemporary borders, that is, an abstract demarcation on the territory which indicates the administrative boundaries of a state. Roman limit is something, it is a thing, a thing which belongs to no one and indicates a sense of transcendence. The limit is holy because it is something where existence is remitted to its beyond: the wall marks the limits within which existence makes sense, out of which the existence crumbles, becomes fragile.
This limit as *limes* is, on the other hand, very architectural. It marks an interruption, a before and after, both spatial and temporal.

[1] "Those things consecrated to God ritually and by pontiffs are sacred [*sacratus*]" (Justiniano, 1989: §8). "But we call the walls holy [*sanctus*] things, because there is established capital punishment against those who have committed crimes against the walls in some way" (Justiniano, 1989: §10). Both holy [*sanctus*] and sanction [*sanction*] share root in Latin: the consecration of a law or norm. Therefore, the ambiguity between sacred and holy in English translation is alien to the original version.

Spatially, the limit was an unstable fringe, a changing one. A space in dispute. Not only militarily, but also culturally. Romans themselves hired Germans to defend their Rhin border. This limit was, first of all, a place of miscegenation. It attracted merchants, families of soldiers destined for border detachments... It was threatened by incursions... In short, it was a space of exchange and culture (Trías, 1999 & 2001).

The *limes* also marks a temporary interruption. Justinian (1898: I, XII, 5), in fact, alludes to the *postliminium* as the one who having been captured by enemies returned to the Empire and, therefore, recovered all his lost rights. The prisoner rescued from the vanquished enemies was also considered to have returned *postliminio*. Inside the limit, based on holiness, temporality before what is beyond the limit can be restored. After the limit there is a temporary interruption, a latency state which can be reviewed.

The limit has, then, thickness. A spatial and temporal thickness. It shelters and gives sense. But it is also a space and time for permanent negotiation: it is the urban condition of expatriation, of uprooting.

3. The City and its Limits

In fact, is it not the city precisely the historical construction of this limit? What is the city if not the human effort to erect those holy walls beyond which his existence is compromised? What is the city if not that space of miscegenation and uprooting?

Let's open a short detour to contextualize what we mean with that.

According to the Bible, God created Adam and Eve. He provided them on Earth with everything necessary for their survival. After sin and expulsion from Paradise, Adam and Eve had children. Abel was the pastor. It was nomadic, therefore. He ran through the land grazing his herds without a fixed location. The entire territory was potentially his living space. Cain, "the farmer of the land," as the Bible says, was necessarily linked to a specific place because of his work. He was sedentary.

Cain killed Abel. After that, as it can be read in Genesis 4:17, "Cain knew his wife, and she conceived and bore Enoch. When he built a city, he called the name of the city after the name of his son, Enoch." The city, which is namely the daughter of Cain, was born after killing Abel, the symbol of the rural world. And, to avoid the punishment of Yahweh, Cain founded a city "far from the presence of the Lord".

Therefore, if the city is a human work, it is in essence as an interruption from rural world, that is with divinity. This opposition between rural and urban world has been, in fact, the key to conceive the city throughout history (Calduch, 2018). The urban was the non-rural and vice versa. And the walls of the city were precisely that holy frontier, this *limes,* which embraced and protected human existence.

But modernity brought the city walls demolition and a new kind of human kind which no longer recognizes the limits of the holy, or to say the least, which considered himself as not recognizing the limits of the holy. The construction of the modern subject is certainly not linear.

Nor is the city (Solà-Morales, 2002; García-Vázquez, 2016). In fact, modern metropolis emerges as an often-conflicting synthesis between two factors. On the one hand, as we said, the metropolis is the city that demolishes its walls. Having no longer a space which limited it, it often grew concentrically, thus replicating the centrality of its previous constitution. But, on the other hand, the metropolis is also the result of a symbolic concentration phenomenon, a goods and resources one. It is the capital city, the *caput-itis*, that is, the head, the centre of power and representation. But it is also the *capitalis-ae*, that is, the place of wealth and goods. Not in vain, it is the engine of the thriving capitalist economic system.

Growth and concentration are thus combined in an open system, weakly planned and constantly revised. The metropolis, which is born from a historical nucleus and grows in oil slick, is *par excellence* the city where conflict takes place. It is the city of barricades, of strikes. It is the city which needs to be destroyed in order to remain. But it is also the city of miscegenation, the city of confidence in progress and technification.

This city, in fact, still provided elements of cultural identity. Those which Walter Benjamin tried to rescue from its ruins in the work *Das Passagen-Werk.* A sort of reminiscence to the lost city, the bounded one, the one which gave meaning as it was limited by the holy walls. Only fragments are left, *places* as Marc Augé accurately defined them, portions of reality, an anthropological place. Those fragments are where there is a coincidence between spatial arrangement and social organization (Augé, 2009).

4. The City without Limits

The Great War marks the end of the liberal city. If the metropolis can be considered the scenario of free capitalist competition and conflict, the megalopolis is the scenario of hyperrationalization and asepsis. Everything is planned: housing, education, transport, leisure... within the framework of the increase of resources and productivity. The metropolis is the city of the boulevard, of passages... of speed and industry. It is the city portrayed in *Metropolis* by Fritz Lang or, even, in the superb *Berlin Sinfonie der Großstadt* by Walther Ruttmann. The megalopolis is the city of great territorial infrastructures, decentralization, the anonymous periphery which extends homogenously through the territory, multiplied *ad infinitum*. It is, if we may, the city portrayed by *Lost in Translation*.

The term "megalopolis" was coined by Jean Gottmann in his study of the Northeast Megalopolis, the northeaster part of the United States. A conglomeration of population centres that stretched along an extensive territory of 800x200 km, inhabited by more than 40 million people in the first 60. The portrait was clear. The megalopolis is essentially and ideally the middle-class city. The most evident expression of the triumph of the Welfare State. A pact in favour of the "end of ideology", a commitment with social conformism. In this case, we speak about the end of the city understood as the space *par excellence* of the conflict. It is the city against which Lefebvre launched *The Right to the City* and according to which Marc Augé coined the successful term "non-place".

These non-places are the characteristic spaces of supermodernity. Initially Augé placed them in airports or supermarkets: where no decipherable symbolic link can be set up. With non-place Augé named a symptom which, as he recalls, "goes through a double and contradictory feeling of overflowing and loneliness, of emptiness and overload [...] what could be called the crisis of the place" (2018: 10), a process which has already reached a planetary scale by means of the new information technologies. The megalopolis, in its growth *ad infinitum*, without limits, has taken over the whole planet. There is no outside from which the city can be referred to. There are no longer proper *places* to the extent that without an outside, in short without a recognition of the limits, there is no possible cultural looking.

It is maybe time to recapitulate.

The very idea of a city seems to be linked from our Semitic tradition to an idea of limit. The city with limit is the finite city. Urban dwelling stands mythically in defiance of its divine origin and knowing itself threatened by its divine origin. Therefore, city with limit implies both localization, and awareness of vulnerability.

In modern metropolis, the walls fell. Still limited, the city aimed to be unlimited. It is the city of conflict in its midst, the city of internal conflict. Having demolished the walls, this city no longer recognizes the limits of the holy, but by questioning it, they are still present. That tension provides some fragments of *places,* remnants of culture.

In the era of supermodernity, the megalopolis or city-world has no proper limit because it became the whole. There is not an inside and an outside in the city-world. There are no gods, no barbarians. It is the city that, becoming infinite, has drowned its limits, narrowing it up to its disappearance. This infinite city does not give rise to conflict. It is the city of asepsis and anonymity.

The city without limit is the infinite city, but it is also the hermetic city, insofar as without limits there is no another one to be recognized as beyond the limit (Lanceros, 2011: 90). There is no longer that temporal and spatial interruption characteristic of the *limes*. It is the self-sufficient, self-referential city. And, therefore, being already a *continuum*, this world-city or meta-city has become a *landscape*.

5. Urban Landscape

Following Simmel, landscape is properly a modern invention. It is the product of the tension between a looking which is always inside but nevertheless want to be outside of what it is looking at. We are never before the landscape, we are always inside it. But, at the same time, the "landscape tradition is that of the aesthetic exercise of looking from the outside" (Solà-Morales, 2001: 154). Remember Constable, for example.

We no longer properly see a city, as the romantics did not properly saw nature. We recognize it, we intuit its laws and its internal logic, but in some way, it has acquired an entity of its own, alien to us. That romantic fascination with nature is what we now identify in the urban-planetary. And the same inaccessibility that romantics recognized in nature, while they considered themselves an indivisible part of it, is the relationship that the urban world holds for us today. Hence, we no longer look at the city. Today we look at the *urban landscape*.

There is a destructive element in modern subjectivity that comes, on the one hand, from the fact that it does not assumes its own limits and, secondly, from not finding something that exceeds it. This tension between the excess of not recognizing its own limits and the abyss of not finding something that exceeds it, leaves the subject orphan, knowing in the end that this abyss is precisely the subject itself. Romantics claimed nature, both inside and outside, as something that exceeded them and, without renouncing to the infinite, they knew how to glimpse a creative tension between that excess and its own abyss.

In my opinion, in the case of urban phenomenon, we find ourselves at a crossroads similar to romantic questioning of enlightened tradition. Insofar as we would be able to understand, as they did, the infinite as what makes the finite appears precisely in its infinite singularity, freed from the weight of universality, we would be able to meet again the city and its places. Looking at the city as a landscape can provide us with that creative tension between the excess of being an infinite city and the abyss of its totality. It is to understand that a non-place can be presented as a place insofar as its lack of limits would be presented as a limit. That's why today the city can only be captured aesthetically.

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CHAPTER #2.05

FAKE ARCHITECTURE

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1. Felt architecture; communicated and deduced feeling

- (I) The subject is placed in a hyperreality of cyberspace: it builds a sense of experience from fragments, the concrete, that provides him or her with proportionate responses and that correspond to his or her initial parameters (they return the gaze to him or her). Postmodern, sensual and concrete thought: the opposing concrete elements produce abstract meanings. There is no transparency in the channels employed, but we experience the illusion of this continuity in our daily environments, accustoming ourselves to the opaqueness of the channel. Sherry Turkle (1997), calls it "judging by the interface of appearances". The subject, accustomed to the channel and interiorized as part of him or herself, naively trusts in the screen, the search for what lies behind becoming irrelevant. Both principles involve a fully phenomenological attitude. The Real behind the screen are bytes; that is to say we are never immersed in the game of appearances without there being an "invisible remnant"; what Turkle calls the mystery of "emergence" and Deleuze (2005,originally published in 1969) "event-feeling", is the emerging of pure appearance that cannot be reduced to mere effect of its material causes, but to the effect of the digitalized Real. Two illusory positions arise: those who maintain that real life would not be a correlation of the hypertext, leaving a modicum of common sense that anchors them to reality; and those who believe that the external life of reality does not exist: it is only another window. Both questions are assessed in self-referenced terms as if knowledge and interface were equivalents. What is true is that certain practices on the web (such as sexuality, meetings, purchases, the search for architectural ideas) are employed as the second dimension: as *ideological fantasy*, given that it combines sexuality, relationships, acquisitions or impossible ideations (related with the Real of the body), with the mind, separated from the body. A space where we experience carnal pleasures doing away with our bodies. Architectural ideation is taken in its enjoyment dimension.

That alters the hermeneutic horizon of our daily experience in three ways –Zizek (2010)- that take place successively: (1) separation between real life and its mechanical simulation (technobiology); (2) separation between objective reality and our illusory perception of it (hyperreality creates an experience of truly artificial reality so eliminating the Lacanian "blind spot"); (3) separation between my fleeting affections, feelings or attitudes and the remaining core of my I, (MUD technology, the multiple uses of domains, undermines the concept of the I or authenticity of the subject). Multiplying the I in a dissemination of competing agents, generating a collective mind, with a plurality of self-images; changing identities, a split or use of masks without any single real person behind. Thus, the first makes us lose the surface that separates exterior from interior; the second always turns our interior into exterior; and the third turns always turns our exterior into interior. This paradoxical process is formalised at the same time as we create illusory alternatives: for example, in contrast to the immobility of the body that is described, we create corporal hyperactivity when doing sport that leads to the same terms of hyperreality by recording them (Just think of the cartographs of emoticons that render things fictitious, from which projects are developed). So, progressively total subjectification would go hand in hand with total objectification. To correct it, Zizek proposes the marxist formula: "the work of culture has to restore the support that natural necessities have ceased to lend". However and on the contrary,

it overlooks the fact that our necessities are gradually being reduced to the natural ones, losing with that the natural coordination between necessity and desire, so producing *symbolic castration*. Evidence of that is the *complete ideologization of culture* and the rise in the *logic of victimization* that derives from the psychic/corporal identity break-up, which in turn derives from the surface/limit break-up separating interior/exterior. In other words: before illusion was imaginary, taking this as a signifier of desire; now illusion is symbolic, taking the sense of that imagined as signifier.

- (II) Communicability in post-truth -Ibáñez (2017)-. The world of the web provides a fragmentation of life and its experience. It returns to the user a very similar image of him or herself, where the *selfie* goes beyond presentation and picks up on our preferences and affections. The products and services contracted respond to our desires. We make a *"bubble filter"* of the web. The result is a *"random and anti-hierarchical vagueness, the fruit of conflicting micropowers, that attain a completely new visibility."*-Rodríguez (2018)-. Byung Chul Han (2013) refers to this as *"psychopolitics"* which opens up differences between transparency and truth. Mark Thompson (2017) appeals to the term *"authenticism"* as an ingredient of political discourse on the web; defined "as expressive simplicity that suggests emotional honour, mixed with suspicions, anecdotal data and statistics, which easily smudge over the truth". Boris Groys (2016) analyses the *"design of I"* on the web as democratized artistic *poiesis*. Harry Frankfurt (2006) points out: unlike the liar, the present *bullshitter* "makes the difference between the truth and the lie irrelevant: because he does not reach, what is expressed is hollow, or because he circumscribes truth to his subjectivity". And so, as Arendt says, the liar's version is more rounded, economical and closer to rationality and utility, and is, above all, more beautiful. A dimension that situates beauty in the epicentre of the problem. The current architectural aesthetic, subject to other demands (politics, society, culture, ideology), in a communicative-fictional context, is felt and semiotic. And with that, its resources, including the lie: understood as formal lie (without being committed to the state of the facts) and material (error), which would demand an implication –Derrida 1997, and also brought by Catalán in 2005-. Moreover, the excessive nexus with fantasy (that connects *fiction, pretence and ingenuity*), through the dual life on the web, as well as the yield benefited from, contaminates *feeling* by being used as a non-veritable channel. Sometimes hyperaestheticized, others as hyperbole of the reality and also as replacement for it. And, thus, beseiged by post-truth. Let us consider 10 modalities of contamination in the feelings-object desire points of reference.

(1) **Pose or simulation** is its equivalent, made with gestures, actions, omissions or silences. Francis Bacon (2005, originally published in 1925) points to three degrees of the subject's intimate feeling that we can transliterate to architecture: (1.1) *Reserve*, discretion and secret: when one does not let them observe or know who the work is by. (1.2) *Dissimulation* (negative simulation) when the work shows signs or arguments of it not being what it is; (1.3) Positive *simulation*, when the work pretends, diligently and expressly, to be what it is not (Catalán 2005). Keeping quiet about oneself, covering up certain characteristics or building up signs to present things in another way.

(2) **Banality**: the lax lie that does not require that conscience and is better suited to architectural acts: such as formulaic emissions, partisan litanies or slogans, presented as popular mandates. This formula is better developed when politics, culture and aesthetics are combined (slogan, contemporaneity and beauty). Beauty translates into goodness and with that acceptance. On the web, it is articulated in a more complex way: goodness brings with it an identitary beauty assumed to be of its own. Due to various factors of the web: tendency to self-deceive, loss of the truth perspective, secret circulation of information, plots or conspiracies. And so, a purpose emerges in the form of "completeness and irreversibility"[1] .

[1]Installation of the message requires constancy and permanence: in contrast, volatility and the unforeseeable are proof of its evanescence.

(3) **Contrafaction**: alternative deeds or hypotheses in which we put ourselves in order to experience vertigo (political activism), but without losing sight of its hypothetical nature. This is not only fictional, but on occasions exhibits itself as "*documentary*" (like some cartographic architecture): preparing a set of justifications both strategic and pseudo-cultural, self-justifying its goodness in a new aesthetic. They do not contain the seriousness and rigour that the genre requires, even contradicting our experience of the world, generating strangeness and paradox that serve to spur on their penetration. Fiction ends up taking itself as reality through beauty, empathy and the deployed feeling, its driving force is enjoyment.

(4) In form of **notion**: developing an argument that enters into contradiction with documented and evident facts. Its impulse comes from: the lack of credibility in the facts external to one's own experience, the ignorance or mistrust in that documented and the substitution of evidence (as historic fact) by that experienced on the web in a subjective manner. Language and history lack recognition as the symbolic order of reference and are replaced by the new order, extracted from shared inter-subjective experience. This requires certain properties: emphasis, overaction and insolence that lead to legitimization by merely stating "creating a para-universe of alternative fact"-Rodríguez 2018-, (BIG).

(5) Low-cost lies or **mendicity** are the most frequent: fake that achieves public relevance through the media that consecrate it. It has no pernicious effects on the social body, does not confront parties, and does no harm -Rodríguez 2018-; but it does disrupt the disciplinary order by its reiteration. The legitimizing coverage of the media provides it with reach. They emerge to wink at the ambivalence of words and instability of feeling". M. Foucault (1996), appeals to attentive observation in narratives: not for their meticulousness, but because they are "triggers of reality", in the sense of their performative power –Rodríguez 2018-. Otherwise, we shall live in the "emphatic theatre of the day-today" that will become reality by the perlocutionary force of the story.

(6) **Notoriety** or **engagement** profiles another status; it is produced in professional intrusion, the usurping of skills or in scarce scrupulousness. Now, not through ingenuity or excessive persuasion of the author, or from best intention, but through excessively popular publicity that forms part of the naive fake –Zizek 2010-. Its spreading into channels disrupts the structural bases. It is well suited to that architecture that is spreading on the web, of mediocre authors with pretensions of being high and mighty, developing metaphors and puerile metonymies of no depth at all, taken for useful and good for being felt so, serving as a guideline for the development of the project.

(7) The strategy of **illusion** or **pseudographomania**: Outstanding in the work of Arent and Derrida is that *pseudo* may mean both lie and fiction: guile, error, deception or fraud. In contrast to communicative ethics and the conductism of Habermas and Apel, Eco puts emphasis on falsity as epistemological incentive –Rodríguez 2018-. The sign being the place of inference: that which allows us to know something else (Peirce). However, at the same time, interpretive abuse (deconstructionalist excess) against the community of interpreters and the literalness of the text, redounds in *caricature*.

(8) **Kitsch**, or properly artistic lie –Eco 1986-: is not contrary to the truth, neither in the epistmiological sense or the ethical sense, but to authenticity. Not so much referring to originality, but to loyalty: loyalty to the material handled; to the public, whose capacity is mistrusted, dating back to symbols of that symbolized by them. It contains a hypnotic duality: First, it substitutes the action of the act of imitating for the imitation of the effect of imitation (not of its sense and sensitivity, but sentimentalism and sentimentality), like the fabrication of the reaction expected. Second, it commits that spectator who enjoys not the work but that prefabricated effect, that is, to "himself": to liquefaction or intimate bubbling up of his or her I, trapped in the homeopathic magic of the effect. However, not all architecture of the masses: only those that aspire to elevation, that "in order to justify their stimulating function of effects, coat

themselves in the spoils of other experiences and are sold as art without reservation" –Eco 1986-; not that which provokes effects serving as facilitating mediation, decoding the message.

(9) **Enthymeme** based on **persuasion**: Eco refers us to advertising practice. It consists of providing a parody of argumentation that invites the receiver to complete an incomplete reasoning. It is capricious and induces us to take decisions, like assenting to an ideology or accepting paradoxical inference from sketchy premises through recourses belonging to an already assumed universe that push one to "make what we have always made". Worthy of propaganda and mass persuasion –Eco 2005, originally published in 1968-, that does not draw the clear and distinct concept in another place, in case of which it would be stimulating. The sketch induces acceptance.

(10) **Arqui-Look-Alike**, **duplicator** or **suasion:** the discourse brings into play resources of persuasion that are not presented as such. Suasion is short-circuited enthymeme where its persuasive nature is not perceived. "Suasive is all that that does not allow one to distinguish between arguments, proofs and examples" (Rodríguez 2018). Look alike "is when original and copy are not distinguished".

Summary; These *objects of* contaminable *desire* generate currents of *identification*; these configure beliefs and conform a feeling that become immune to the demonstration of the factual truth or to refutation. Bolstered by opinion, the excuse of reach, the excuse of scope, the hallucination, in cognitive relativisms, ambivalent or unstable factuality or even in the "alternative facts". That makes lie and fiction indiscernible; both are cut out from the same background of the factual truth (the discourse of facts); the first without prior agreement and the second with prior agreement. Here, the shift with sincerity from the web, actions represented or identity rule by defect as agreement –Zizek 2010-.

- (III) Confusion between emerging sensitive and emerging empathetic. Nowadays a aesthetic modality of citizens empowerment is evident; that promotes certain *participative aesthetics*; of a "povera" status, fungible and of nostalgic reference. Transcending the *aesthetics of emergence* and giving preference to all political practice exercised in the public space constitutes in itself a proactive cultural experience. They generate empathy, emotional links and pacific inter-subjective relationships, transmuting that with emerging sensitive and translating these as cultural expression. They operate: sincerity in order to pass from fiction to reality; populism as agreement in fiction. The culture of the webs subject to inter-subjective relationships makes the beautiful derive from the same sentiment, not from an objective instance, the pleasantly experienced predominating over the factual truth. All of that builds up emotional feeling that links social, political and cultural practices with beauty, replacing the constructive sensitive approach to signs of external reality with internal shared signs of equal effectiveness. These *displacement dynamics*, (transposed/displaced emotions) exceed the pregnancy with the reality and is presented as *assault of fantasies;* first the fantasy of a folk world, libertarian and pacifist world, taking transgressive culture as oracle, which offers the temporary simulation of an alternative world. Second, an experience of self-governance that liquidates institutions: power of the people on the web. Reflection of a desire without object (with the plus of errant pleasure) of its proponents imposed by force of repetition, in the hope that, from such practices, a new extendable social order will be reborn. And thus the response to the initial question traces an asymmetry; *identification-imaginary projection* as against *symbolic identification* (it adopts a more real and binding mask than the true features hidden behind it). Because "computerization undermines performativity" (Derrida); as the discipline knows, performativity can always go wrong for structural reasons (Lacan), as it can only arise on the backdrop of radical undecidability, which virtuality and world of present fantasies is not capable of assuming –Zizek 2011-.

- (IV) Architecture follows viral guidelines; It spreads and juxtaposes on the webs. It builds the *legitimacy chain*: it substitutes exposition/ presence and its excess/permanence or

verification; it replaces constancy/durability; hologram or render/reality. It symbolizes political transformations and new experiences of inter-subjective lives. This hyperreality defines a role of beauty/shared-identity, deduced from managed inter-subjective practices. This simulation destroys all trace of objectivity, empowering aesthetic recreation not from the sense of its sensitive emergence, but from the previously granted and later verified sense in emotional acquiescence that derives from subjective feeling. Identical psychoanalytical conformation of the object of ideology, with the *retroversion effect* and retroactivity of meaning (Zizek 2010).

2. Conclusion

The *subversion of the subject* or how to convert nothing into something? The philosophy of radical critical current takes the *clinamen* symptom that explains this transformation. From psychoanalysis we know that *pleasure* is ontological aberration, the *perturbed equilibrium*. It expresses that minimum of contraction that confers its density to the reality of the subject. Although the symbolic universe of a subject may be perfectly organised, this intrusion totally lacks sense, the clinamen may upset everything without being avoided, as only in that *symptom* (empowerment by recognition, fantasy) does the subject find the density of being: deprived of it, his or her universe remains hollow –Zizek 2010-. Every inter-subjective encounter that derives empathetic relationship is equivalent: because it when I find the Other beyond the *wall of language*, in the reality of its being. When I meet the Other in the moment of his or her pleasure, I can observe tiny details, compulsive gestures, tics that indicate the intensity of the reality of his or her pleasure. This pleasure is the *place* of the subject: his or her impossible being-there, or Dasein, hence it is always displaced and unlinked in relation to him. This is the reason of the primordial *off-centring*, greater than that which guards the subject with the grand Other, symbolic-language order (external site of the subject's truth that can never subjectivize or integrate. Any subject, as belonging to the category of hysteria, must constantly question the existence of that pleasure, i.e. the negative to being fully identified with the object that "is": *Am I really that?* Thus, pleasure designates the ahistoric nucleus of the process of historicization. Only by crossing fantasy can the subject avoid that confusion, as his or her *fundamental fantasy is what provides the framework that sustains the pleasure, in which he or she can see/understand*; when I distance myself from the phantasmic framework, I no longer reduce the pleasure to what I see/understand, to the framework of meaning. Libidinally, this enthusiasm for activism, participation in inter-subjective relations where they recognise me and I constitute an empowered subject, has the same profile. Hence, virtuality, ideology or present architectural practices that link politics-society-ethics and culture constitute a off-centred subject that develop in fantasy. That operate in symbolic identification.

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3

BLOCK 3: IDEATION AND REPRESENTATION IN ARCHITECTURE

INTRODUCTION TO BLOCK 3

RESEARCH AND INNOVATION IN THE FIELD OF CONCEPTION AND REPRESENTATION OF ARCHITECTURE

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In his well-known book *Why Architects Draw?* Edward Robbins stated: *"Drawing is at the root of architecture. It is the instrument through which architecture is most often brought into virtual and actual existence."*

The drawing is, therefore, an instrument that is not only the base of design and constructive practice, or if it is wanted, in the processes that allow implementing the architecture, but by providing the imagination with a vast margin of freedom, it is effective in conceiving and planning utopias, exploring processes and opening new paths to knowledge. In short, the drawing is an essential part in the theoretical and speculative processes related to architecture, in any of its many approaches.

A tireless researcher like Johann Wolfgang von Goethe affirmed in his *Die Metamorphose der Pflanzen* (1790) that "If you want to walk towards the infinite, go in the finite towards everywhere"; his innovative method, the questions he formulated and the comparisons he developed allowed a deeper understanding of the processes studied at the time.

In this search for innovation are currently located the three investigations presented are found, which are also aligned with several of the objectives, actions and important challenges that the European Union instituted in the *Horizon 2020 Program* and which supported the *Spanish Strategy for Science and Technology and Innovation 2013-2020*, which has established and guided the priorities of our country in the field of research in the last seven years.

These lines will be extended and strengthened in the next *Framework Program for Research and Innovation* being prepared by the European Union, and under the title *Horizon Europe* is being designed for its application during the period 2021-2027.

The pillars supporting this program are based on innovation, the creation of structures and competitive research groups on the basis of fostering international collaboration and synergies, and the visibility and open dissemination of results through actions and policies that favour "open science". In short, it aims to address the challenges facing society to improve the lives of citizens, breaking down barriers that may hinder collaboration between public and private agents.

The contribution of Marina Sender, Manuel Giménez Ribera and Juan Serra entitled *"Reflections about the computer means with which we produce architecture to maintain control over the entire process"* proposes a didactic approach in developing a search into the limits of architectural drawing, on the base of its use and possibilities of communication that open the new digital tools. Through this search, the authors have sided themselves with the "Society" challenge, focused on the design of science-society transfer mechanisms, as well as with the strategic action "Information and Communication Technologies" proposing the dissemination of the culture -in this architectural case- through the use of ICTs. As indicated by the *Horizon Europe* guidelines, from 2021 "open science" will have to be based on the four concepts of location, accessibility, interoperability and reuse (which make up the acronym *FAIR: Findable, Accessible, Interoperable, Re-usable)* and in the requirement of public availability of data *(Open Research Data)*.

This contribution progresses along these lines since, in an essentially visual cultural context such as the one we live in, the authors analyse the numerous possibilities offered by computer-assisted drawing together with other digital graphic techniques -such as photomontages, info graphics, etc.-, to control the entire creative process of the project, from the conception of ideas to the realistic simulation of objects and

the way in which they are perceived, using, in the words of Professor Carlos Montes, "graphic substitutes".

The authors do not evade the problems implicit in their character of illusion, nor the fact that such substitutes means a complementary way to express the architectonic ideas among many others – as the texts or those other supports can be, that permit the introduction of the movement and sound. On the other hand, by widening the panorama of possibilities offered by digital media to architectural thought, the contribution provides a useful and most up-to-date reflection for teachers and students of architecture. And it is at this point that they affect the European challenge that looks to design and propose new strategies to attract students to the different levels of education.

Very different is the applied approach of the contribution entitled *"The church of Our Lady of Puig (Valencia), a sample of typological variety of cross vaults"* and presented by a team of seven researchers led by Professor Esther Capilla Tamborero, which focuses on the subject of rigorous documentation of built heritage.

In this case, the European challenge to which the proposal is based is that of "Social Sciences and Humanities", and, within it, research is extended to the areas of effective management of heritage resources and their dissemination.

In this sense, the research is an example of scientific rigor in the design of the work methodology and in the application of the photogrammetric techniques of architectural surveying. It represents an important advance in the knowledge of the ribbed vaults and their constructive singularities. And as we have seen in other contributions from the same area of knowledge, its link with the possible teaching strategies and the motivation of students is a priority.

The group of researchers made up of Ana Torres, Juan Serra, Jorge Llopis and Anna Delcampo provide a very different approach in their research "Architectures for the improvement of living conditions in the third age", in which they are directly involved in the second pillar on which the *Horizon Europe* call is based, "Global challenges and industrial competitiveness", and more specifically in the strategic actions in "Health" and in an "Inclusive and safe society".

Precisely for the field of "Health", priorities are specified, among others, in the areas of intervention in health throughout the life cycle, in the assistance systems and in the environmental and social aspects that determine health.

Similarly, the action aimed at "Inclusive and safe societies" pays special attention to interventions that take into account economic and social transformations, as well as protection and security, aspects that are both closely related to care services.

In an increasingly aging society and in which the number of elderly is increasing, the improvement of the living condition of this age group is priority. Based on the study of the evolution of residence models and their typologies, the authors address an interesting reflection on the evolution of architecture for the elderly and the essential adaptation of the design of everyday spaces to their needs. As a consequence, the result of this evolution has been the appearance of new residential models built by private cooperatives and solutions such as shared housing (co-housing) that, although they lack health services or hotels, not only enhance human relations but also they favour the "feeling at home". This is currently a trend in the field of healthcare architecture.

It is therefore clear that from the field of the theory and practice of architecture, urbanism, spatial planning and landscape, and the expression and architectural graphic ideation, the possibilities open to research and innovation are numerous, and this has been shown in the selection of contributions presented, which are representative examples of different lines and approaches.

In all of them, the three types of impacts are recognised that constitute the key to the progress, which the *Horizon Europe* is after.

Firstly, the aim is achieving a scientific impact by providing new high-quality knowledge, but also by strengthening human capital and promoting the dissemination of knowledge and science "open" to society. Secondly, the foreseeable social impact will be achieved through the design of policies and important strategies of the European Union that will be considered on the

basis of research and innovation, their expected benefits and direct transfer to society, which will have a visible and effective participation. Finally, the essential economic impact will be achieved through growth based on innovation, and this will result in the creation of new and better jobs and influence financing of new research.
Also in this regard it should be highlighted that, in all cases, the work has been developed as a team by competitive groups of researchers belonging to the Universitat Politècnica de València, of whom follow a consistent trajectory and, in spite of their youth, are perfectly consolidated, constituting a benchmark and have "created a school" within their specialties.
For this reason, initiatives such as presented here are particularly relevant and timely, since they not only make known the research being developed and the interests of the different groups, but through direct contact can facilitate future synergies.
Two hundred years later Goethe's reflection in his *Conversations with Eckermann* continues:

"So, what has been the intention of my studies [...]? My intention has been: collecting all the experiences in this discipline, to do all the tests and to carry them forward in all their diversity, but also in a way that they are easily reproducible and do not elude the vision of the majority. And then present the proposals in which the experiences of the highest genre can be expressed, and wait to see to what extent they are also ordered under a higher principle."

A relationship between individual experiences that can only be validated in that connection of the group that advances knowledge.

CHAPTER #3.01

REFLECTIONS ABOUT THE COMPUTER MEANS WITH WHICH WE PRODUCE ARCHITECTURE TO MAINTAIN CONTROL OVER THE ENTIRE PROCESS

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1. Introduction

Reflecting on the computer media with which architecture projects are produced and expressed is now a priority to maintain control over the entire creative process. If we do, the final result of the drawings will incorporate the most appropriate tool in the line of work followed to achieve the desired objective.
The current graphic design programs with the virtual architectural model leads to new ways of architectural representation. It is especially important for the architecture student to correctly use these graphic procedures that make attention to the intentions, to the abstraction to a different narration of the architectural project. In the graphic expression, the intention of the architect when preparing the images that represent the architecture takes on special importance.

"... I the intermediary intention of the imagination, in that imagination is the only area where it is possible to reproduce reality and its conditions, simplifying its components and dispensing with its tolerances, in order to examine the available means to overcome or avoid them, to anticipate active schemes that lead to possible changes and organize behavioural control systems.."(Seguí de la Riva, 1993)

According to the representation systems used to represent the architecture, different readings can be generated according to the different perception and knowledge mechanisms that they propose. Fig. 1 Axonométric representation. Case Study houses.
The correspondence between the architecture and the tools used in its conception leads us to the discussion about the relationship thought-language. Fig. 2 Virtual representations of figures that generate the architectural form.

Figure 1. Pierre Koenng, case study house 21.

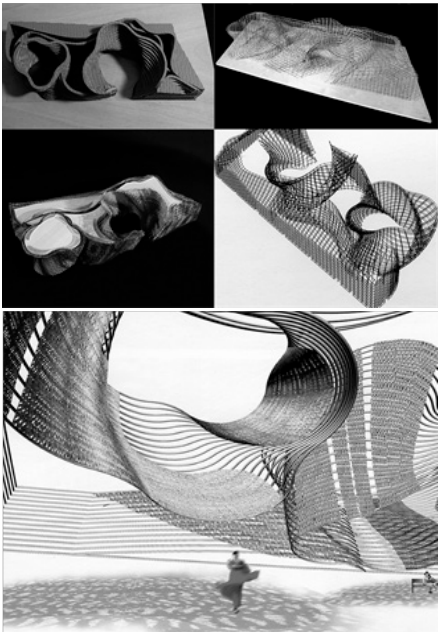


Figure 2. EMBT, Spain pavilion, Shanghai international exhibition; conceptual procedure / digital modeling.

A strong graphic exploration has characterized and suggested these new searches through the review and resemantization of traditional representation systemsor from the incorporation of the innovative resources of digital simulation. Today we have to acknowledge that new horizons appear that will influence the representation of architecture. Digital technologies that allow the generation of the interactive virtual model, the augmented reality, the video formats, are the new fields that we are going to consider as an added value to the current architectural representation.

2. Conceptual drawing versus realistic drawing

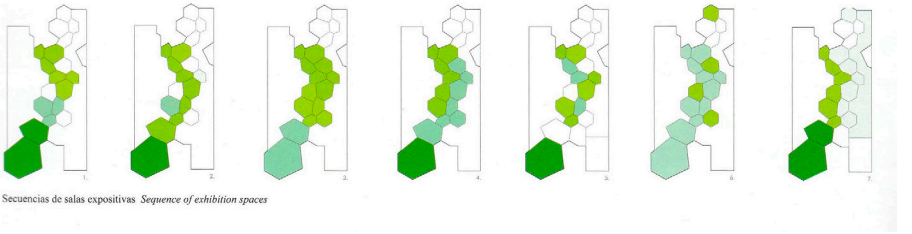
Although we usually talk about how much a drawing resembles reality, it is evident that there is a great distance between the perception of a three-dimensional reality and what is contained in a two-dimensional support, either a drawing or a screen. We share the reflections made by professor Carlos Montes, about the relationship between drawing and reality. Through the drawing we try to find effective graphic substitutes that are capable of transferring information similar to the one we receive from reality when we observe it. (Montes Serrano, 1992, p. 18) Usually the art of representation is not the illusion, but information. That is through the use of a conceptual drawing, in pictographic origin offers images that represent reality not because of the similarity they have with it, but because of the meaning they convey as effective substitutes. Fig. 3 Realistic representation David Chipperfield project.

When we talk about conceptual drawing, we refer to the one that aims to convey objective and unequivocal information about reality through the use of a codified graphic language and with numerous conventions that may require some training in the recognition codes of the observer[1]. Unlike the realistic drawing, the conceptual drawing is based on very simple schemes or conventions, which are known rather than perceived, and which avoid any kind of ambiguity,

But it is important to emphasize that, through digital tools, the ability to represent the idea, the aspects of genesis and concept, has improved significantly. The conceptual drawing has evolved and changed. Drawings such as those presented by Nieto and Sobejano in the exhibition of their project help the viewer to understand the fundamental architectural intentions. Fig.4 Conceptual representations project Nieto and Sobejano.

Figure 3. David Chiperfield architects

[1]Carlos Montes uses the example of the arrow to indicate direction. A conventionalism that would hardly be understood by a person outside our culture (Montes Serrano, 1992).



Secuencias de salas expositivas *Sequence of exhibition spaces*

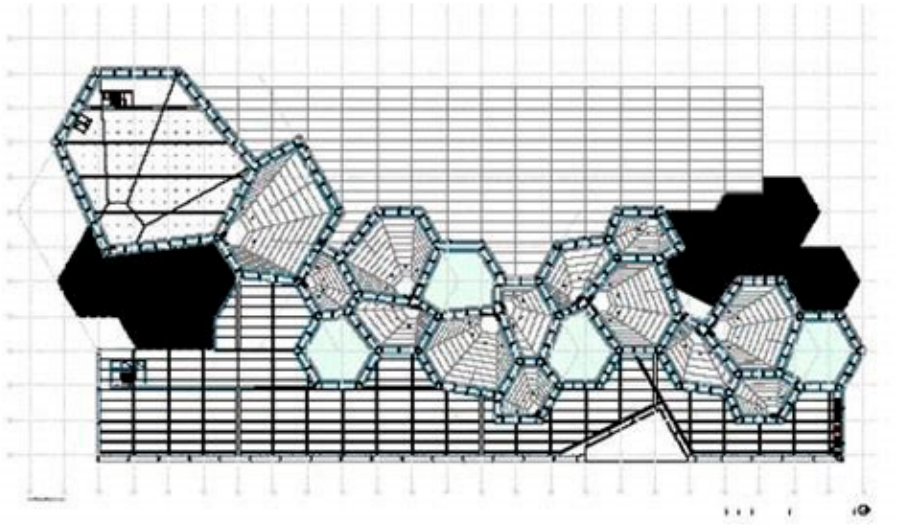


Figure 4. Nieto y Sobejano, Andalusian Space of Contemporary Creation, Cordoba.

On the other hand, the realistic drawing also has an illusionist character, which tries to achieve the natural and visual appearances of the objects, and which, in a somewhat contradictory way, is more ambiguous, since it is impossible to reach a perfect replica of reality through a graphic representation. The realistic drawing incorporates other graphic resources such as tonal gradations or chiaroscuro that imply greater ambiguity in the information transmitted, and therefore loss of objectivity.

In this way, the realistic drawing with the objective the conceptual drawing, achieves an effective substitute, a minimal representation capable of transferring the necessary information to evoke reality unequivocally. It is throughout history, and fundamentally with a broad effort by artists since the s. XIII to XVI, that the drawing was accommodating the primitive perceptive schemes to much more realistic graphic conventions. From rigid medieval forms to much more true formulas during Renaissance and Mannerism. Fig 5. Realistic representation of the interior space.

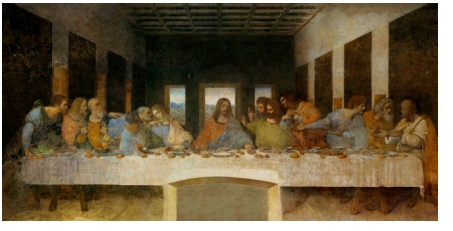


Figure 5. Leonardo da Vinci, The last supper.

It seems that the natural tendency of man is to draw what he knows more than what he sees. We can say that there have been two pedagogical methods that tried to modify this innate tendency to conceptual drawing. The first one involves the search for an innocent look, not conditioned by cultural habits or recognition schemes, so that reality can be approachedwithout awareness of its meaning, in the manner of impressionist artists. The second pedagogical path consists in deepening in an analytical vision of reality, that through an analysis of the forms, allows to improve the conceptual schemes of the objects, their geometric and dimensional properties. We think that this second path is the right one when we talk about architectural representation. However, Professor Montes says that despite the popularity of this second theory, there is no agreement between knowledge and representation, and although knowing analytically known, this does not guarantee a correct learning of the future architects.

"The analysis of the forms does not directly influence the drawing, but helps to refine our hypotheses of form and meaning of the objects; it provides us with recognition schemes that facilitate the continuous process of articulation of the information received, and make it easier to find an effective equivalence between that hypothesis or recognition scheme and the graphic scheme necessary for the representation of the form."(Montes Serrano, 1992).

From this point of view, the learning of a draftsman should be based more on doing than in the analysis, since the greatest difficulty is not retaining a form in memory, but translating it into effective graphic schemes, substitutes for reality that the artist contrasts with reality and so readjusts and corrects them. Something that also requires graphic motor skills to internalize the appropriate movements, whether pencil or mouse.

The conceptual representationaims to offer information or describe an object without any ambiguity, forgetting the anecdotal or the mutable, trying to fix in very simple schemes and with the help of conventions the subjects represented. On the other hand, the realistic image moves away from the didactic schemes and tries to reach the natural and visual appearances of the objects. They demand of the spectator an active participation, in order to capture the meaning of what is represented, supplementing with their previous knowledge what the subject represented conceals or omits. (Montes Serrano, 1992).

We have already commented that as in any presentation of an idea, and especially in the architectural representation that requires an important graphic load, there are currently formats that can provide added values such as sound and movement support, as opposed to written support, and Through them you can get a relationship between the spectators and the represented object before constructing that proposal.(Sender Contell et al., 2012). Fig 6 Creative process. Virtual representation and model. Frank Gehry.

Figure 6. Frank Gehry, Guggenheim museum Bilbao.

3. Conclusion

The conventional limits of the graphic representation of architecture have been overcometo reproduce ideas, order them, use them and count them. We must constantly work and reflect on the reinterpretation of the architect's language, in the conceptual representation, in the formal representation of the project, in the transmission of ideas and intentions.

There is no doubt that the relationship between the object and its image is directly linked to the representation systems that have been used for its knowledge. In this way, the mechanism of perception depends on these systems conditioning the forms of reading for the recognition of the architectural object. Today we can talk about the great development that digital graphic techniques have achieved, and the techniques they support without being architectural techniques, such as photography, video, infographics, augmented reality,and therefore the importance of this reflection to the time to train new students. Fig 7.Virtual representation and conceptual section. Two images of the same project.

It is important to highlight the strong impact of visual culture in architectural documentation, especially in the digital image(Subirós Brunet et al., 2017). And this becomes important not only in the representation of the current architecture, but also in the field of architectural heritage documentation, where these techniques have opened a new horizon of possibilities in view of their ability to simulate the perception and enjoyment of part of the historical heritage.

The wide range of possibilities for architectural graphic expression does not stop at the planimetric representation, but mixed and interactive procedures are often used, which have an important indicidence in the perception of a third party. These advances open up many possibilities for the future of graphic architectural expression and for its diffusion outside the purely academic field.

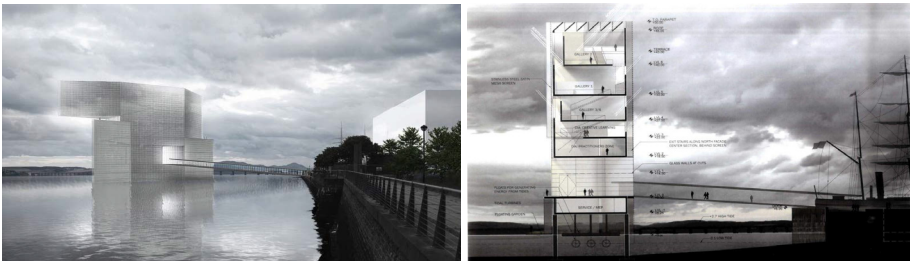


Figure 7. Steven Holl architects.

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CHAPTER #3.02

THE CHURCH OF *NUESTRA SEÑORA DE EL PUIG* (VALENCIA), A SAMPLE OF TYPOLOGICAL VARIETY OF CROSS VAULTS

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1. Introduction

The Royal Monastery of Santa María de El Puig is a representative building of Valencian history, art and architecture. In 1969 it was declared a historical-artistic monument by decree 1747/1969 of July 17. It is also a religious symbol; the King Jaume I *El Conquistador* declared to the *Virge de El Puig* patron saint of the ancient *Reino de Valencia*. In 1237, the founder of the *Orden de la Merced,* San Pedro Nolasco, discovered the titular image of the church. In 1238, King Jaume I ordered the construction of a sanctuary that collapsed in 1300, according to various historians. Several authors collect aspects of the foundation of the monastery, such as Cabanes Pecourt (1986). The primitive construction "must have been very modest" (Garín et al., 1986, p.426) and little has been preserved. The thirteenth century is the century of the great conquests of Jaume I and the construction of relevant buildings in the Valencian territory. We highlight some: the year 1238 was the conquest of the city of Valencia directed from El Puig; between 1238 and 1261 one of the first apse vaults was built in the church of San Juan del Hospital in Valencia and the chapel of King Jaume I in the same church (Navarro, 2004, p.94). It is also necessary to mention the beginning of the cathedral of Valencia in 1262.

Figure 1. The vaults of the central nave, with the presbytery in the background. Source: P. Alemany. (2017).

In the fourteenth century, Admiral Roger de Lauria († 1305) began the works of the current sanctuary of Santa Maria de El Puig, which would continue his wife and his daughter Margarita. (Benito, 1983, pp. 55-56). In the interval 1588-1590 (Benito, 1983, p.59) the works of the monastery that gave the group the current configuration began, works that continued during the following centuries.

The church of Santa Maria has three naves; the central nave (Figure 1) has greater height than the lateral ones. Taking advantage of this difference in height, windows are opened in the central nave. It has five sections or panels and chapels between abutments, open to the lateral naves. The longitudinal axis of the naves has an east-west orientation; the presbytery is in the east and the choir is on the west side. The door to the church from the outside is located on the north wall; initially it was at the foot of the first church built by Jaume I. It has a choir located at the foot; the current construction being a work made in the twentieth century. The naves and most of the side chapels on the Gospel side are

covered with simple cross vaults; the apse and chapel of the baptistery are radial cross vault and there is a star with five keys on the same side of the Gospel. On the side of the Epistle, two of the chapels are covered by lobbed vaults; the one that covers the chapel of San Pedro Nolasco has oval –or elliptical- geometry (in phase of study); the latter was paid in 1663 by Mrs. Clara Salt de Cavallón. (Fr. J. Parra, 1970, No. 155). The Communion chapel located in the northeast tower of the monastery is covered with a spherical dome. It has the *Camarín de la Virgen*, built between 1766 and 1780 (Benito, 1983, page 62) and it is covered by a dome decorated with frescoes by José Vergara, whose geometry is being studied by Capilla, Calvo y Gómez-Collado.

We focus here only on the cross vaults of the church. We present an advance of the study that is being carried out by Capilla Tamborero in the research project "Valencian cross vaults from the 13th to 16th centuries. Geometric analysis of its elements". This work is being developed as a continuation of the doctoral thesis "Geometry, art and construction. Vaults in the Valencian Kingdom during the XIII-XVI centuries", defended at the Universtitat Politècnica de València in 2016. The research carried out has had the support of two collaboration scholars during the 2016-17 and 2017-18 school years: Patricia Alemany and Saúl Aroca, respectively. Also, four Final Degree Works have been developed on some vaults of the same church by undergraduate students in Fundamentals of Architecture of the Universitat Politècnica de València: Javier Magán, Adrián Pastor, Javier Plaza and Mª José Sanchis. The church of Santa María de El Puig has been chosen for the development of the mentioned research given the relevance of it; it is one of the first built during the Gothic period in the Valencian territory. There are several studies on the monastery and the church; specific to its vaults we highlight the doctoral thesis of Navarro Fajardo (2004).

We expose here only an advance of the geometric analysis that is being developed of the elements that integrate the vaults and their spatial geometry. To do this, surveys have been carried out using direct or traditional measurement and multi-image photogrammetry, with the support of points taken by means of a total station.

2. The cross vaults of the church of the monastery of Santa María de El Puig (Valencia, Spain). Graphic survey and geometric analysis

We can verify that different authors collect: the first valencian cross vaults are built in religious buildings. They were also built in civil or military buildings, but there is an direct relation between the origins of Valencian cross vaults and religious buildings, as happened with the Gothic in general as Pijoan explains. When he talks about the bourgeois Gothic style, he says "(...) we have focused our attention on religious monuments because it was, when they were built, when the Gothic style was created." Pijoán (1948, p.554)

The naves and most of the side chapels on the Gospel side of the church of Santa Maria are covered with simple cross vaults, in rectangular sections. The vaults of the presbytery and the chapel of the baptistery are *ochavadas* with radial ribs and squinchs. Both were built in the fourteenth century, but the presbytery was reformed in the last third of the twentieth century. The chapel of the Immaculate, also on the side of the Gospel, is covered with a starry vault with *tercierons* and five keys; it is considered the first built of this type in Valencian territory (Zaragóza, 2000, page 62). The cross vault of the choir is a reconstruction of the 20th century that tries to imitate the Gothic cross vaults.

2.1. Simple cross vaults on the naves

The vaults of the naves, both central and lateral, are simple cross vaults. They are arranged in rectangular sections. The dimensions of the span in the sections near the presbytery are: 5,74 x 5,02 m, in the central panel and 3,38 x 5,02 meters in the lateral ones. The severies is built with bricks arranged to *sardinel*. The crossing ribs are of half a point; the wall-archs and transverse archs have ogival geometry (Figure 2). The formers support on *roll modillions*. The transverse archs also, but they do not do it directly, but they rest on small semi-pilasters with capital that start in the *roll modillions*. All the wall-arches and transverse archs support on pillars of cruciform section (Figure 2).

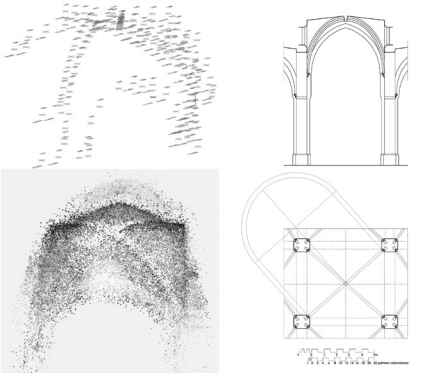

Figure 2. Vaults of the central nave. On the left: cloud of points taken with total station (above) and with the photogrammetry program, Photoscan (below). On the right, plan and vertical section with a graphic scale in meters and Valencian palms. Source:E. Capilla Tamborero. Collaboration:P. Alemany and S. Aroca. (2017, 2018).

2.2. Simple cross vaults in the Merced's chapel

The *Merced's* chapel has a rectangular floor plan with sides of 5.33 and 3.52 meters. The vault that covers it is a simple cross; the severies is made of stone. Its height ranges between 8.84 and 8.92 m at the highest points of the spine line, and 8.57 m on the underside of the key. The spine line on both axes is practically horizontal. The rectangle enclosing the profile of the crossing ribs measures: 12.7 x 28.5 cm. The crossing ribs have a radius of 3.11 meters in the intrados. The support is produced through a capital on column supported on a bracket 0.22 cm from the ground at the northeast and northwest angles; the support is direct on corbels 5.61 m from the ground, at the southeast and southwest angles. The spring of the nerves at the northeast and northwest angles occurs 0.11 cm below the southeast and southwest angles; to solve the vertical tangency in the springs, this height difference is solved with a vertical section of the nerve at the northeast and northwest angles. The geometry of the vault may vary somewhat from the original of the fourteenth century, being a reconstruction of the twentieth century, dated 1968 (Fr. J. Millán, 1968, n.135). (Fig. 3) A more detailed study of the vault has been developed in the Final Degree Project of the Mª. J. Sanchis Casabán.

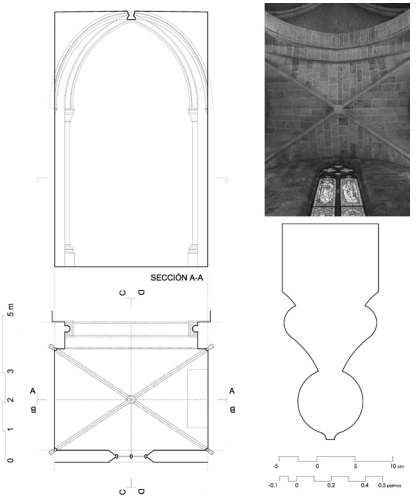

Figure 3. The Merced's chapel. On the left, plan and section. On the right, above, an image of the reconstructed simple ribbed vault; below, profile of the crossing ribs. Source: Mª J. Sanchis Casabán (2018) .

2.3. Radial cross vaults in the presbytery and in the baptistery chapel

The presbytery and the baptistery chapel have radial simple cross vaults. Both support on squinchs; the one of the presbytery with *tercerol* and the one of the baptistery on conical squinchs. The latter is preserved since its construction in the fourteenth century; the vault of the presbytery underwent a restoration in the 20th century and the original nerves were hidden. Given the limited extension of the present communication, we refer here only to the vault of the baptistery chapel and leave that of the presbytery for another occasion.

The baptistery chapel is located at the foot of the side aisle of the Gospel, in the bell tower of the church. It arises, in a first approximation, from an octagonal plan (half octagon) that rests on conical squinchs, as can be seen in the sketch of Figure 4. Through these, the chapel passes from a square shape to a polygonal shape. The ribs of the vault are born in the vertices of the polygon resting on two types of corbels that adapt to the angles of the walls. The curvature of the nerves is defined by arcs of a quarter of a circle, but the start and arrival mode of the key is different.

The two nerves next to the lateral nave have their start and their arrival at the key tangents to a vertical and horizontal plane, respectively. However, the quarter of the circumference of the ribs near the north wall has the center displaced; in this case, the nerves pull tangents to the vertical but do not get tangent to the key. A more detailed study of the spatial geometry of the vault and its elements has been developed in the Final Degree Project of the A. Pastor Climent.

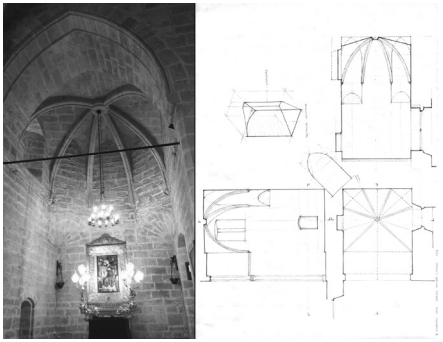

Figure 4. Baptistery Chapel. On the left, image. On the right, sketch for the documentation and geometric analysis of the chapel and of the radial cross vault that covers it. Source: A. PastorCliment (2018).

2.4. Starry vault in the chapel of the Immaculate Conception

The chapel of the *Immaculate Conception,* located on the side of the Gospel of the church, was built in the early years of the fourteenth century, by order of Roger de Lauria before his death in 1305. It is a starry cross vault with tercierons and five keys. The supports of the ribs are produced directly on the fasciculated pillars attached to the four angles, without any capital or intermediate bracket. Navarro Fajardo (2004, p.121) compares this continuity of the fascicles of the pillars with the vault of the chapter house of the convent of Santo Domingo in Valencia (c.1300), although in this case the pillars are entire. This vault also has an exceptional value because it is the first five-key star vault that is preserved in Valencian territory (Zaragoza, 2000, p. 62).

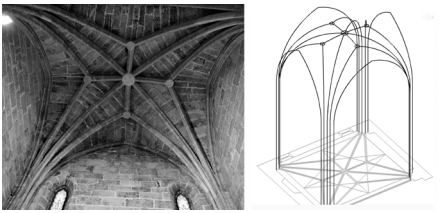

Figure 5. Chapel of the Immaculate Conception. Starry vault of the XIV century. Photo and 3d model. Source: J. Plaza Montesinos (2018).

The vault is inscribed in a rectangular plan; It has diagonal arcs of half a point and pointed wall ribs. The rampant nerves of the two main axes are curved, while the spine line of the severies in the four panels that emerge from the walls is straight. (Figure 5) A more in-depth study has been developed by a Final Degree Word of the J. Plaza Montesinos.

2.5. The vaults of present choir, an intervention made at the end of the 20th century

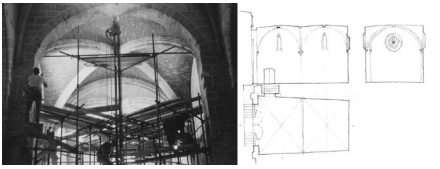

Figure 6. Vaults of the choir at the foot of the church. On the left, photo during the intervention in the 20th century. (Source: AMP, VI, G.) On the right, sketch for the study of the vaults. Source: J. Magán Cortinas (2018).

In the middle of the 20th century various interventions were carried out in the ecclesial group; one of them corresponded to the intervention in the vault of the choir, arranged at the foot of the church, on the west side. Fr. J. Parra (1970, n.155) describes how the new church built after the demolished church in 1300 and it had a high choir at the foot of it, but there is no record of what it was like. The intervention, carried out in 1964, was done according to Román Jiménez's solution (Fr. J. Millán, 1968, n.135). It consisted of the demolition of the choir built at the end of the XVII century - around 1669 - and its replacement by two sections built with simple cross vaults on a trapezoidal floor. The

ribs are of stone and start from corbels without pilasters or attached columns. The severies is from brick to *sardinel* like the rest of the church. The intention was to follow the Gothic construction but the geometry has nothing to do with that of the naves or the arches of the Gothic period. The diagonal ribs are not semi-circular nerves but elliptical, according to a first approximation (Figure 6). A more detailed study is being developed in a Final Degree Project by the J. Magán Cortinas.

3. Conclusions

1. A small sample of the advances in the investigation of the vaults carried out in the church of the monastery of Puig has been shown here.

2. In the church of Santa María de El Puig, there is a typological variety of cross vaults built in the 14th century: the simple cross vaults in the naves, the radial cross vault in the baptistery chapel or the starry vault in the chapel of Immaculate. There is also the fourteenth century but restored in the twentieth, as the presbytery, and others; also twentieth century as built in the choir or rebuilt the Merced's chapel and father Jofre.

3. For the individual conclusions of each vault, we refer to the information in the section dedicated to each one.

4. The research continues to be developed for a more in-depth study of all the monastery vaults, both original ones from the 14th century, as well as those built or reconstructed in the 20th century.

4. Acknowledgements

We want to thank especially the religious of the monastery of Santa María de El Puig - Father Melchor Azcárate, Father José Sesma, Father Cristian Peña, Father Manuel Anglés and Fray Juan Merino (RIP) - the predisposition and the facilities given for the development of the research in the church, as well as the information provided.
This research project has received the support of two scholarship assistants financied by the *Ministerio de Educación, Ciencia y Cultura* during 2016-17 and 2017-18: P. Alemany Pereira and S. Aroca Tévar, respectively.

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CHAPTER #3.03

ARCHITECTURES FOR THE IMPROVEMENT OF LIVING CONDITIONS IN THE THIRD AGE

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1. Introduction

The habitat we live in, its spaces and the environment conditions, represent in a larger proportion one of the most important and indispensable emotional states in which people acquire multiple perceptive aspects. Consequently, architecture and the design of spaces, light, colour and other environment conditions generate different sensations according to the activities performed in our everyday life (Torres Barchino et al., 2018).

To humanise and to achieve a more liveable environment is a necessary condition to help to improve the well-being and the quality of life of people. It is evident that, in recent years and for the next decades, population age will continue increasing; ageing will accelerate and will become more intense. According to the last studies carried out in Spain since 2016 by the Institute of Social Services and the Elderly (Instituto de Mayores y Servicios Sociales – IMSERSO): *To support and to improve the quality of life of older people is one of the main challenges that raises the process of ageing.* (IMSERSO 2016).

For this reason, this research study aims to share and to reflect upon built architecture targeted to people whose situation of dependence has been increasing in our society (Figure 1). During the Project[1] process, several architectural existing typologies have been analysed both at European and at national level, as well as the specific characteristics of the spaces where residential everyday life takes place.

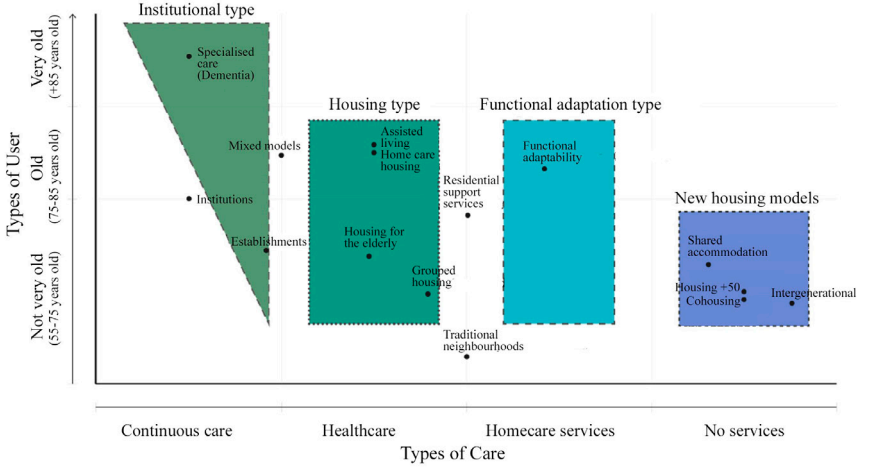

Figure 1. Summary of the European existing housing models and their location depending on the type of user and the care needed. Source: (Sancho et al., 2017).

[1]I+D+i Project called "MODIFICATIONS ON VISUAL COMFORT IN RESIDENTIAL CENTRES TO IMPROVE THE QUALITY OF LIFE OF OLDER PEOPLE", reference BIA2016-79308-R. (Acrónimo MODIFICA), of the State Program for Investigation, Development and Innovation orientated to Societal Challenges, in the frame of the State Plan for Scientific and Technical Investigation and Innovation 2013-2016.

The existing residence models at present happen to be a list with different nuances that can be identified as: day-care centres (as a type of home); residential care services; residential homes and housing for older people. Public residential homes are the ones where more architecture-related deficiencies are found. Therefore, it is urgent to raise the issue of performing a series of modifications and alternatives more in line with the current needs of the different stages of life depending on the type of user. Likewise, we must take into account other existing experiences in view of the immediate need to project thinking about the future of our society (Delcampo Carda et al., 2016) by making progress in architectural design and in innovation to obtain a more suitable evolution.

2. Historical analysis

Before the existence of the current residences, the permanent attention centres for older people were the so-called "asylums". In other words, institutions that are part of a period of time whose role was "to provide shelter, guard and seclude" to people with heterogeneous needs, so that, at the same time as they were giving response to certain individual situations, they were trying to solve global issues of the society such as begging and vagrancy.

The beginning of the first building model aimed for older people known dates back to the 19th century. At European level, it is during this time when the so-called institutional models can be found as the evolution of former asylums and houses of charity, which provided healthcare and housing at the same time (Lantarón, 2015).

Nevertheless, in Spain, at the beginning of the 20th century, we can only find isolated examples of these institutions for older people. In fact, these were institutions run by religious orders where older people, diverse mix of people with special needs, and orphans all lived together. Similar to the rest of Europe, these institutions were based on charity. It was after the Second World War when religious orders started to specialized in the field of the medicine (Barenys, 1992), stepping forward in the evolution of these kind of institutions influenced by the Modern Architecture. "Outdated institutions are enlarged with modern buildings full of light, ventilation and views where the infirmaries are located. Therefore, institutional models are renovated as models that gather the postulates of the Modern Movement, at the same time as they inherit the offer of housing and healthcare" (Lantarón, 2015, p. 86). They are no longer managed and attended just by religious people but by the Public Administration too.

The 1960s were characterized by the increase in the development of promoters' housing associations, which began to be interested in this field due to the available subsidies to construct and to manage housing for older people (Cabrera Fernandez-Pujol, 1993). During the next 20 years municipalities and local promoters' housing associations contributed with most of the housing units for older people.

In the 1990s, the large-scale construction of residences for not dependent older people started to boom in Spain; buildings were constructed in the urban environment to favour the interaction with the cities' resources. This architecture, currently present, is based on hospital and hotel models. The former "asylums" started to transform in new "residences" in order to achieve a change of mentality and overcome existing prejudices in the matter.

Nowadays, residences are conceived as centres of community services that, unlike asylums, seek to include older people in society, avoiding maladjustment and rootlessness (Ministerio de Sanidad Servicios Sociales e igualdad et al., 2012).

3. Current residence models

As we have seen, the institutional model targeted to dependant older people is linked to the final periods of life, as well as to the high need of help. The following paragraphs describe the evolution of architectural residential models for older people at national level from their beginning until the present day. To do this, we will base our work on the chronological development elaborated by the KDA (Kuratorium Deutsche Altershilfe), Germany, that has been adapted to the current spanish system.

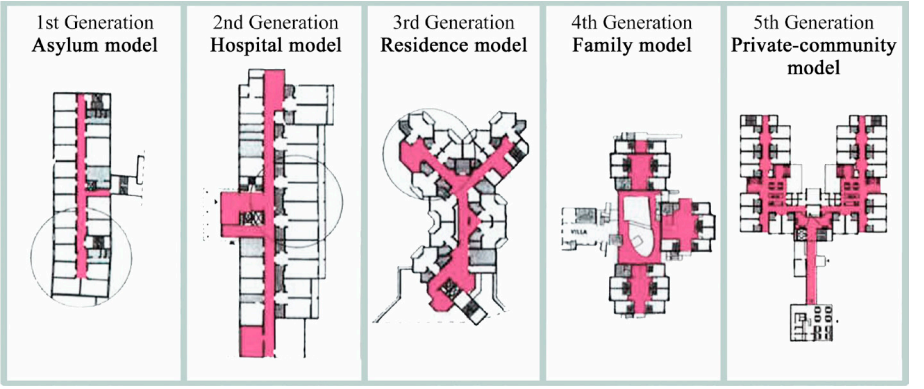

Figure 2. Chronology of residential models. Source: (Ministerium für Gesundheit Emanzipation Pflege und alter des Landes Nordrhein-Westfalen und alter des Landes Nordrhein-Westfalen and Kuratorium Deutsche Altershilfe (KDA), 2012).

This is a sequence that enables us to understand the architectural conditions that have determined the development of spaces intended for the care and well-being of older people:

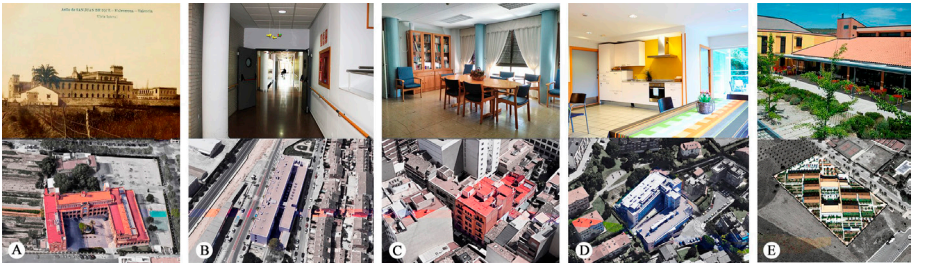

Figure 3. From left to right: A. The Asylum-Hospital of San Juan de Dios 1907, ***asylum model****. B. Residence for the elderly in Manises, Valencia,* ***hospital model****. C. Lledó Residence for the elderly in Castellón,* ***residence model****. D. Residence project "Etxean Ondo Residences" co-living units, Lamourous Gerontological Center, Matia Foundation of San Sebastian,* ***family model****. E. Cohousing in Torremocha de Jarama, Madrid,* ***private-community model****.*

As mentioned previously, the first architectural reference corresponds to the ***asylum model.*** This model is characterised by high resident occupancy, as it is designed with a succession of rooms that can accommodate the maximum possible number of people. Bathrooms are shared and there is scanty presence of common and working areas. There is also a minimal healthcare team. All of this results in a sober and rigid architecture; architecture that is projected as a "shelter".

As the second generation we can find the ***hospital model*** as a response to the deficiencies of the first generation. This model organises shared bedrooms for two or more people along long corridors that occasionally share common centralised areas. It is specialised in the field of the medicine and geriatrics and the resident is

treated as a "patient". Architecture is projected as a "place of healthcare", characterised by its impersonal and hospital design. At present, it can be considered the predominant residential model in Spain. Nevertheless, the actual awareness of the importance of the habitat points to the need of more advanced residential models.

The **residence model**, as the third generation, corresponds to a renewed architecture, with a more elegant and defined distribution in order to improve the spatial quality of the residents, by introducing the idea of a "home-loving design". A more private architecture is promoted by reducing occupancy and by having a higher proportion of habitable space favouring personal independence. Architecture is projected as "place of residence". In this way, a dual functional perspective begins considering gerontology and housing. In Spain, the interest in moving forward this model is currently growing, especially in the private sector.

As the fourth generation model we find the family model, a person-centered architecture, focussed on the resident. Its design is getting increasingly closer to a home, in contrast to the healthcare or hotel model. For this purpose, spaces are designed with domestic dimensions and are organised in "co-living units" with a capacity between 10 to 20 residents. Every co-living unit combines "public" spaces with private ones, which have individual rooms with bath, and common areas for every unit. This model is widely spread in Europe; however, despite the growing interest in this matter in Spain in recent years, it constitutes a less common model.

Finally, the fifth generation model: the **private-community model** is a residential model that consists of private dwellings or apartments adapted for older people, in which it is possible to live individually, with a partner or in group. Common areas are designed as an extension of dwellings within the urban complex. These include: services, social and leisure activities, dining rooms and, in the end, community life, and, in the case of Spain, through cooperatives. The resident plays a more active role and person-centered integrated care prevails. Various examples of this are: apartments with services, some housings with this type of care, or, the new residential model of 'self-managed' communities called "Cohousing", which is very common in USA and European Countries like Holland, Sweden, France, Germany, Denmark. At national level, there are specific initiatives of developing this architectural typology, still they have started to become established.

The different architectural environments and new designs of spaces in other European cities, enable comparison with Spanish residential architectures. As we can observe in the comparative chart of the different existing models of housing in different countries, not many typologies coexist at present in Spain; the predominant ones are residences of second and third generation.

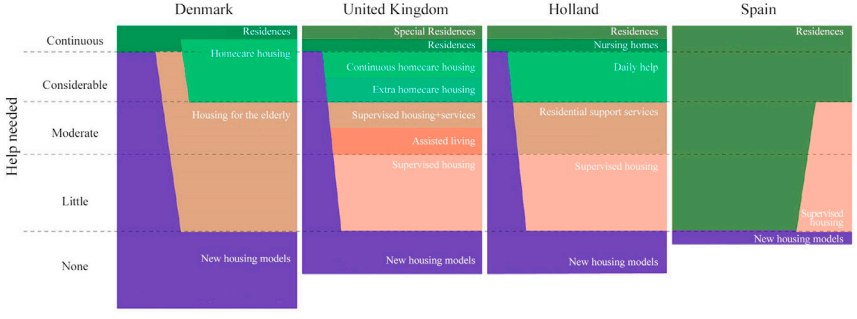

Figure 4. Comparative chart showing the different existing models of housing in different countries. Source: (Sancho, 2017).

4. Conclusions

As we can see, this architectural development expresses, according to every period of time, the necessary design aspects for each generation depending on its needs and the type of architectural spaces required.
The study of physical spaces generated for meeting the real needs of the activities of such a vulnerable group, everyday life and the relationship with the contemporary city are the basis to do so.
The present Research Project, currently in force, addresses and delves deeper into the need to look for alternative solutions focussed on the improvement of environments for personal independence, as well as the research of models which offer worthy environments to live in and that meet needs of such a vulnerable group.
This research provides a results preview in which an initial classification of architectural models depending on the historical period and the environment requirements demanded by the development and evolution of active ageing awareness stands out.
It is an architecture that leads to cohabitation groups where the idea of an elderly society is under debate and that delves deeper into the need of creating friendly architecture focussed on the individual, as well as in the need to be able to choose where to live.

5. Acknowledgements:

Project I+D+i of the State Program for Investigation, Development and Innovation (Programa Estatal De Investigación, Desarrollo e Innovación) orientated to Societal Challenges, in the frame of the State Plan for Scientific and Technical Investigation and Innovation 2013-2016 (Plan Estatal de Investigacion Cientifica y Técnica y de Innovación 2013-2016). Call for entries 2016. Funded by the Ministry of Economy, Industry and Competitiveness (Ministerio de Economía, Industria y Competitividad) and the State Investigation Agency (Agencia Estatal de Investigación) and co-financed with European Union ERDF funds.

"MODIFICATIONS ON VISUAL COMFORT IN RESIDENTIAL CENTRES TO IMPROVE THE QUALITY OF LIFE OF OLDER PEOPLE", reference BIA2016-79308-R. (Acrónimo MODIFICA)

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Lantarón, H. G. (2015). Modelos de alojamiento para personas mayores; Orígenes, Evolución y Tendencias. *Actas de Coordinación Sociosanitaria,* 15, 20.

Ministerio de Sanidad Servicios Sociales e igualdad, & IMSERSO. (2012). *Guía de centros residenciales para personas mayores en situación de dependencia.*

Ministerium für Gesundheit Emanzipation Pflege und alter des Landes Nordrhein-Westfalen, & Kuratorium Deutsche Altershilfe (KDA). (2012). *Das Pflegeheim im Wandel – Perspektiven für die Betreuung von Demenzkranken. Landesinitiative Demenz-ServiceNordheim-Westfalen.* Euskirchen, Germany.

Sancho, M., & Lantarón, H. (2017). *Viviendas y Sistemas Alternativos de Alojamiento para personas mayores en Europa*. San Sebastián, España.

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4

BLOCK 4: CITY, TERRITORY AND LANDSCAPE

INTRODUCTION TO BLOCK 4

CITY, TERRITORY AND LANDSCAPE. A JOURNEY THROUGH THE CONTEMPORARY URBAN DISCIPLINE

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1. Introduction

The urban discipline as a matter of scientific knowledge of the urban phenomenon has more than a century of trajectory. It has been defined with contributions and complementary visions that have been rooted in the passage of time and forming with it a solid cultural base. At present, the urban studies run from a global perspective and as a framework, have different levels of approach. The city, the territory and the landscape, with their internal and external dynamics and with their different scales, form study scenarios from multidisciplinary and interdisciplinary perspectives. Thus, during the course of the 20th century, an increasingly diverse vision of urbanism and the sciences that study the city and the territory have been produced. Its traditional definition as a whole of form and function has been incorporating social, environmental, geographical, economic, heritage and historical aspects, to which the progressive development of ideas on sustainability in the urban environment have been added in recent decades.

Society has become aware that the development of cities is putting at risk the survival on Earth, proposing actions that link the socioeconomic development of our species with the degree of environmental deterioration[1]. In this sense, it is important to highlight the role that some institutions have played in incorporating these issues in the legislative field and in the field of research. Among them, and formalized in various documents, it should be noted, as a pioneer, the Green Paper on the Urban Environment[2] of 1990, the report for the Government of the United Kingdom published under the title *Towards an Urban Renaissance*[3], as well as the manuals published in 2005 and 2008 as a result of the European Ecocity[4] research project. Thus, the lines of research opened since those moments, have begun to incorporate the study of sustainability indicators and quality of life standards that take into account economic, ecological and social aspects, to be incorporated into programs and public policies for development and urban well-being.

To this disciplinary body has been added, with regard to urban vision, the concept of "global city"[5], as a particular form of economic and productive organization in contemporary urban spaces, which acts by channeling financial, informational and technological flows. This concept materializes as a network of geographical places with a spatial organization without borders and deterritorialized, but centrally concentrated. This new vision has extended the urban discipline to the whole planet in a globalized way, which shows that the development of Western urban societies has taken a different path from the rest of the planet. However, the current state of research includes only a part of the urban discourse, which should be revised to understand the basis on which its foundations are based and because, in addition, some of the lines of research that began decades ago have been resumed nowadays. Among them, we can cite those that have been recovered by Jacobs, Gehl and Wythe for the speech, since they introduced novel ideas about the design of cities for the inhabitants that have

[1]World Commission on Environment and Development: Our common future, 1987

[2]EU Commission: Green Paper on the Urban Environment. Brussels: Commission of the European Communities, 1990

[3]Rogers, R. (Chair): Towards an Urban Renaissance: The Report of the Urban Task Force, Executive Summary. London: Department of the Environment, Transport and the Regions, 1999

[4]Gaffron, P., Huismans, G. & Skala, F.: Ecocity Book I: A better place to live, and II: How to make it happen. Wien: Facultas Verlagsund Buchhandels AG, (I) 2005, (II) 2008

[5]Sassen, S.: The Global City: New York, London, Tokyo. Princeton: Princeton University Press, 1991

resulted in recent and ultimately successful interventions. The processes of transformation of the public space attending to the needs of the users have supposed effective improvements, however, the political collaboration and the support to the designer has been fundamental in reaching these aims.

2. Foundations of contemporary urban discipline

The emergence of urbanism as an institutionalized discipline is a consequence of the break with the idea of a baroque city as a work dependent on its simple architectural formalization. The classical doctrine of urbanism appeared from the second half of the nineteenth century, and was fed with the first theoretical treaties endorsed by the numerous operations of urban reform and extension of most European cities, which responded to the serious problems arising of the massive displacement of the population from the countryside to the city.

However, at the beginning of the 20th century, problems had already changed focus and scale as a result of democratic, social, economic and technological progress, therefore the discipline embraced new ideas in which the function was the basis of conformation of the city to the detriment of the traditional urban form. This should be, above all, support for the basic activities of working, residing, moving and spreading, abandoning the previous urban tradition and the idea of a more complex and diverse city.

Its widespread adoption and its implementation since the 1940s, had produced a deterioration of the urban environment, and a breakdown of European and American cities. The design principles of rationalist urbanism were not enough to form a project of a rich and lively city, which motivated its revision from scratch with the very crisis of the model and a general questioning of the urban discipline.

This review branched out into two main lines within the architectural and urban debate. On the one hand, the one began by Team X[6] with the incorporation of the traditional urban form in the discourse of the enrichment of the space relationship and the overcoming of strict functionalism. On the other, the morphotypological base initiated in Italy by Muratori[7] and continued by Aymonino[8] and Rossi[9], with its variants in Belgium (Krier[10]) and France (Krier[11]), which recovered the traditional public space as an integrating mediation of the city project, where its historical core was taken as a paradigm of complex and rich reality in which citizens identified to face their future.

In parallel, the revision of urbanism outside the collective of architects was raised, on one hand, from an external view of the discipline, with fierce criticism of the doctrine of the CIAM of Jane Jacobs[12] and on the other, with incorporation of citizen participation to urban planning processes, hand in hand with the theories of *Advocacy Planning*, by Paul and Linda S. Davidoff[13]. These experiences, together with the writings of Lefebvre and Castells, among others, led to the emergence of social movements that claimed the human condition of the city, and a fairer construction process; in contrast to the contemporary methodologies of scientific or systemic urbanism that came to explain the city as a complex machinery that, despite everything, was possible to control thanks to the evolution of cybernetics and systems analysis, initiated by McLoughlin[14] and Chadwick[15] .

In the Anglo-Saxon realm, architects turned their eyes to the theories of a morphologically based city. Prioritized those based on perception,

[6]Team 10: «The Doorn Manifesto 1954» en Smithson, A.: Team 10 Primer. Cambridge: The MIT Press, 1968.

[7]Muratori S.: Studi per una operante storia urbana di Venezia. I: Quadro generale dalle origini agli sviluppi attuali, Palladio, n. 3-4, 1959.

[8]Aymonino, C.: Origini e sviluppo della città moderna. Padova: Marsilio, 1965.

[9]Rossi, A.: L'architettura della città. Padova: Marsilio, 1966.

[10]Krier, L. & Culot, M.: Contreprojets. Bruxelles : AAM, 1980.

[11]Krier, L. & Culot, M.: Contreprojets. Bruxelles : AAM, 1980.

[12]Jacobs, J.: The Death and Life of Great American Cities. New York: Random House, 1961.

[13]Davidoff, P.: «Advocacy and Pluralism in Planning», Journal of the American Institute of Planners, 31. Boston: American Institute of Planners, 1965.

[14]McLoughlin, J. Brian: Urban and regional planning : a systems approach. London: Faber, 1969.

[15]Chadwick, G. F.: A systems view of planning: towards a theory of the urban and regional planning process. Oxford: Pergamon Press, 1971.

experiences, so they were considered close to the reality of the city. Since the early 1950s, both in the United States and in Britain, the importance of the visualization of the urban environment as topics of morphological analysis and planning guide was highlighted. Visual perception and planning as a form of aesthetic design were addressed mainly by Cullen[16] .

For his part Lynch[17] experimented his theory of the imaginable, which sought to establish identity and structure in the process of visual perception. As the formation of the image included observer and object, it was possible to strengthen the image of the city through the re-education of the perceiver or through direct action on the urban form. Later, Alexander structured a system in defining the environment by means of rules or patterns understood as a codification of design principles through which the problems that usually arise in urban and architectural design were formulated and solved.

Within the postmodern disciplinary reflection of urbanism one was able to question its own future existence. Koolhaas[18] argued that the construction of the city is influenced by a multitude of points of view, with financial power being the most influential, with which its effective development occurs without the past control of town planners and architects.

However, the debates of the postmodern period ended up consolidating two new basic concepts on which to build the discipline and, with it, the city: urban planning and the urban project linked to the definition of architectural and urban forms. According to Campos-Venuti[19], in this dilemma between plan and project, the result seemed contradictory since the former was removed from reality as it was considered a totalizing element, too broad to be really capable of suggesting behaviors to the public authorities public and private initiative. On the other hand, the consideration of controlled areas to develop urban projects was lost to the higher dimension of planning, setting aside aspects such as the coordination of infrastructures, the great singular facilities, the treatment of natural resources, respect for the environment and attention to the social sciences, without which a proposal of urban form coherent with a physical approach that would deepen its roots to the socio-economic motivations of the inhabitants of the city would never be reached, as Pecourt[20] affirmed.

3. Spanish discipline

In Spain, in the late sixties and early seventies, architects were trained with the urban culture of rationalism, tarnished with the approaches of systemic urbanism and post-war Anglo-Saxon empirical urbanism. At that time there were only two Schools in Spain, the one in Madrid, since 1844, and the one in Barcelona, since 1875, so that the urban planning and its conceptual, methodological and instrumental adjustment in urban morphology extended to other cities of the State only from them. In the postmodern debate between urban plan and project, one could say that Madrid opted to prioritize the plan and Barcelona, the project. Hence, the fact that Madrid based its instrumental strengths on the objective sources of computable data, while Barcelona has always relied more on the synthesis of the form. This bipolar reality of urban studies in Spain can help to understand realities and general trends. The trajectory of some figures of the panorama of urban planning in Spain can also help to synthesize the previous statements.

Fernando de Terán, from Madrid, as a researcher of Spanish planning and of Hispanic America, has always defended the role of the State, even in the planning of Barcelona, exemplifying the wise allocation of Ildefonso Cerdá's project for the Ensanche, against the criteria of the City Council. Also, it has put in value the legislative efforts of the State Administration and Urban

[16]Cullen, G.: The concise townscape. New York: Van Nostrand Reinhold Co., 1961.

[17]Lynch, K. The Image of the City. Cambridge: The MIT Press, 1960.

[18]Koolhaas, R.: «What Ever Happened to Urbanism?», 1995 en OMA, Koolhaas, R. & Mau, B.: S, M, L, XL (pp. 959-971). New York: The Monicelli Press, 1995

[19]Campos Venuti, G.: «Plan o proyecto. Una falsa alternativa», Ciudad y territorio: Revista de ciencia urbana, 59/60. Madrid: IEAL, 1984

[20]Pecourt, J.: «El diseño urbano como filosofía del planeamiento», Ciudad y Territorio: Revista de ciencia urbana, 67. Madrid: IEAL, 1986.

Planning of the Municipal Administrations, in the rationalization of the urban processes in Spain[21]. Today he is one of the references in the struggle against the mercantilist conception of land and the city, which by neglecting the regulatory role of public administration has produced a speculative phenomenon that has been one of the factors that has accentuated the consequences of global economic crisis in Spain.

The urban planning thinking of the School of Madrid (José Fariña, Agustín Hernández Aja, Ramón López de Lucio, Javier Ruiz and others) emphasizes the social and environmental sustainability aspects, deepening the relationships between social inequality and urban planning of the urban peripheries, in general, and Madrid, in particular[22], working closely with economists such as José Manuel Naredo or sociologists such as Jesús Leal. The latter, a reference for the investigation of urban morphology, mainly to elaborate and continuously update the maps that reflect the socio-spatial structure of the city[23].

In the School of Barcelona, the indisputable figure for the identification of the start and the first stage of theoretical and practical production of contemporary urban planning is Professor Manuel Solà-Morales. His studies in Rome with Quaroni and in Harvard with Sert, gave his training a great solidity in the global understanding of the urban phenomenon from architecture. His connection with the School and the urban processes of Barcelona provided him with a scope of work that was singularly interesting from the cultural and technical plans[24]. Solà-Morales believes that mainly urban research should be applied. His invitation to the fusion of analysis and practice in the studies of urban morphology, through the action, had a great diffusion in Spain because he was the founder of the magazine Arquitecturas Bis and UR and director of the *Laboratori d'Urbanisme de Barcelona*. According to Colomer, this condition, together with its proximity to Ludovico Quaroni, overshadowed to a large extent the presence of Saverio Muratori and Gianfranco Caniggia in the thoughts about Spanish urban planning.

Regarding the aspects linked to the urban growth and architectural practice, the city of Barcelona itself has been a laboratory for the production of urban projects, starting in the 1980s, under the direction of Oriol Bohígas and Manuel Solà-Morales himself and arriving with newness to this day, with research and project work such as those of Joan Busquets[25], which analyzes and classifies the urban layout, its geometries and dimensions within very globalizing considerations, but very contextual at the same time. Likewise, Joaquín Sabaté from the School of Architecture of Barcelona, updates the resources extracted from these lines of research-urban project, taking them to the landscape, making the updating of this component of urban studies, visualized as social, spatial and material heritage.

In this synthetic journey through urban studies in Spain, it is worth mentioning the research from the University of Barcelona, by Horacio Capel and the Scripta Nova journal, a benchmark for urban morphology studies, analyzing the urban and territorial reality from a geographical perspective, with special emphasis on the Spanish-American sphere. Capel's studies on socio-spatial inequality and cartographic updating are particularly important in the line of research that emphasizes the social use of the city's space, which has now been generalized by the warning, which has also implied, the recovery of Jacobs' works for the discipline.

4. The global vision and interdisciplinary

The current state of urban research is presented, in general, with a comparative and multidisciplinary perspective, incorporating contributions from different perspectives, where geographers, historians, architects, urban planners, landscape architects,

[21]De Terán, F.: Planeamiento urbano de la España contemporánea. Historia de un proceso imposible, Barcelona: Gustavo Gili, 1979.

[22]López de Lucio, R.: Construir ciudades en la periferia. Criterios de diseño para áreas urbanas sostenibles. Madrid: Mairea Libros, 2007

[23]Leal, J.: La dimensión de la ciudad. Madrid: Centro de Investigaciones Sociológicas, 1995

[24]Solà-Morales, M.: Las formas del crecimiento urbano. Barcelona: E.T.S.A.B, 1974

[25]Busquets, J.: Redesigning Gridded Cities: Key Examples. Novato, California: Oro editions, 2016

economists, sociologists and, in general, urban scholars who promote instrumental research and innovation for theoretical updating and improvement of urban practice. It could be said that the recent studies in urban matters form an amalgam of knowledge experiences, generating a broad global scientific base that, due to its heterogeneity, is capable of adapting to the different states of urban development that currently exist in different geographical areas.

From a global point of view, and focusing in big cities, diverse urban modals can be identified that respond to very different problems. However, we can identify, in general, to large groups.

On one had, it is important to consider the cities of fast urbanization located in Asia, Africa and Latin America that in 2017, placed at 72 of their metropolitan area among the 100 most populated in the world. Following this model of "diffused city"[26], occupying areas that are more and more expansive and sometimes-entire regions. Its dispersion, social segregation, and the squandering of energy that the transport system currently generates characterize it, with the deterioration of the urban environment that is, to a large extent a consequence of the uncontrolled use of private cars. This model of development has not only provoked n inefficiencies and a terrible aggression on the environment but it has created social problems. The city has become empty of content, reducing neighbor relations, changing the behavior of the citizens as a consequence in the changes knowledge and the effectiveness, the loss of identity and the probabilities of contact the public space has to offer.

For their part, in Europe, Australia and United States are redirecting themselves towards a model that is more sustainable base don a balanced and harmonious relationship among the social needs, the economy and the environment[27]. In this context, the processes of urban growth in the cities at the beginning of the 21st century has focused on the regeneration ad requalification of the consolidated city. The traditional widespread occupation of territories has been replaced with dynamics of transformation of interior areas of the city that imply, more frequently, operations of regeneration of the system of open public spaces.

The methodological process of verifying these realities has been consolidated as a very useful tool in understanding and projecting cities, which not only has *not* lost its validity, but has been strengthened at a global level with depth and penetration of studies of the urban form in currently very dynamic environments, such as China, Russia or Brazil, in addition to the old Europe itself. Its bases are very consolidated and, therefore, its assimilation has been used in the fields where such tradition did not exist, created in the Anglo-Saxon countries at the beginning of the sixties and, especially, the one initiated by the Morphology Group Urban founded by the urban geographer MRG Conzen and his British collaborators, along with no less important studies of analysis of the urban fabric of the Italian school, with those of Muratori and his followers Caniggia and Cataldi, or of architects and historians such as the aforementioned Quaroni and Rossi, among others. This practice has been exceptionally relevant in the current field of studies of morphology and urban forms incorporating contemporary themes in the construction of the city, territory and landscape of today, characterized by its great interdisciplinary.

So, with the purpose of detecting the current reflections of the discipline, then a series of works framed in this multiplicity of approaches to the urban phenomenon, which are decomposed into a wide variety of fields that receive from the traditional formulation with theories, the study of urban history and urban methodologies, even with more contemporary optics. Among the latter we can highlight: the study of the historical urban landscape, heritage, urban regeneration and resilience, public spaces, the modern and contemporary urban project, the vision of the territory and the landscape, the urban socio-

[26]Indovina, F.: «La ciudad difusa». En Lo urbano en 20 autores contemporáneos (Martín Ramos, A. coord.), Barcelona: Ediciones UPC, 2004, pp. 49-59.

[27]Council of Europe: European Landscape Convention. Firenze: Council of Europe, 2000.

economic dynamics, the co-habitation and mixed uses, the vulnerability of habitat, mobility and technology, eco-urbanism and mapping.
They are the result of a series of contributions made with an interdisciplinary vision, by people who have entered into the study of the multiple urban sciences in order to promote basic research and instrumental innovation, for the updating and improvement of the practice of urban planning.

CHAPTER #4.01

HABITAT EVOLUTION IN IBERIAN EASTERN FAÇADE, FROM NEOLITHIC TO THE BRONZE AGE

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1. Introduction

Following the trail of the stable habitat origins in the continental prehistory frame, leads us to mention the Middle East zone, where a series of long term transformations (social and economical) led to the process traditionally known as 'neolithic revolution'. It basically consists in the adoption of a subsistence system based in agricultural and stockbreeding practices, with all the material and social transformations attached to it. One of the necessary implications, that this kind of life comported, was sedentarization and the appearance of the first small villages in this vast geographic frame.

The domestic space, is in tight relation with the social complexity level of a determined community. The changes in the materials, and the construction solutions are also linked to a series of changes in the social aspects. And certainly, in the middle and near east these evolutions are clearly documented (Cauvin, 1978). The Neolithic way of life, based on the domestic resources usage (both agricultural and animal), follows an expansion from this 'nuclear' area through the european continent, and replaces the way of life of the precedent populations, who were performing hunter-gatherer living strategies until the VIII millennium BC. Therefore we are assisting to an expansion process which clearly shows a chronological East-West gradient, and which finishes with the adoption of the brand new novelties (both material and economical) which will reshape the world.

2. From Mud to Stone

In the eastern façade of the Iberic Peninsula, the neolithic way of life, is set up on the VI millennium BC. We know well the fan of novelties which came along with it, thanks to the archaeological remains (new tools, new animal and vegetal species). However, one of the most blurred aspects in the early Neolithic phases is the settlement pattern; specially the habitat structures.

Considering mainly the material culture of the human groups we can divide the prehistory chronologically in three big phases: Neolithic, Chalcolithic and Bronze Age (between the VII and I millennium BC). Nevertheless, if we analyze the domestic architecture the most clear division we can make is related with the constructive materials used in the building of the houses. So we can find two moments which are consecutive:

- Wood and mud architecture
- Stone architecture

The proofs of open air settlements corresponding to the first neolithic groups are limited. Most of the information available is based on the caves and shelters which are common natural refuges in the calcareous Iberic landscape. The field works performed in some of the Valencian counties have brought to light the existence of these open air neolithic settlements. One of the most notorious is the site of Mas d'Is (Penàguila, Alicante). Some remains located there, have made possible to take a look at a neolithic housing (Bernabeu et al. 2003). We will highlight the so-called 'Casa 1', a big structure (10 x 3.8m) which represents a rectangular floor, with an extreme in apse shape. It has been defined from a group of pole holes and combustion structures. The constructive materials used correspond to wood poles and mud (See Figure 1).

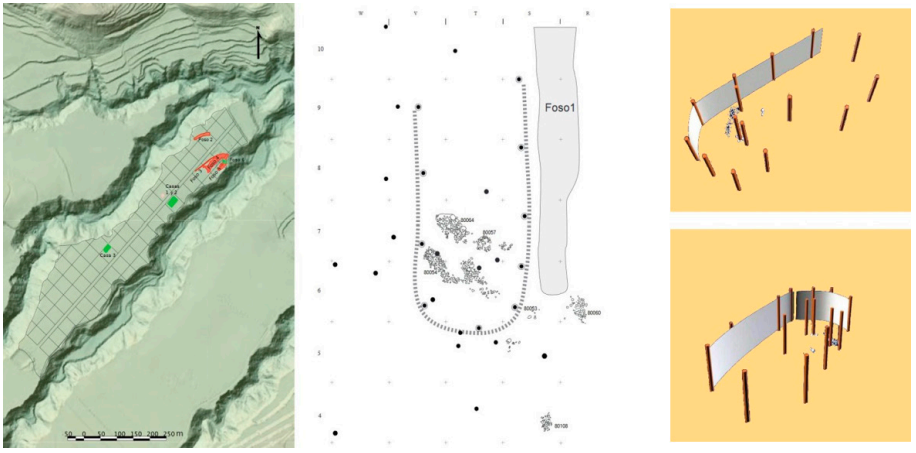


Figure 1. 'Casa 1' Mas d'Is (Penáguila, Alicante). Floor and 3D reconstruction (Bernabeu, Orozco & Diez, 2012).

The settlements location of the first neolithic groups is always near water courses (rivers and ravines) and humid areas (lakes), in fertile and light soils. One of the main recognized traits for this prehistoric phase, in this area, is the low work investment dedicated to the building of the housing. These houses should be grouped with big spacing between them, and always nearby the cultivation areas.

From the V millennium BC on, we can observe a series of transformations which would be considered a reorganization in the territory occupation and exploitation system. The result is a different settlement pattern (Bernabeu 1995) which is shown in the popping up of huge size settlements, in the lowlands of the valleys, with storing pits (silos), and sometimes with surrounding ditches, as a delimiting structure and habitat frontier. One of the traits of these settlements is the big amount of excavated structures in the ground, all of which show different morphologies and sizes. Their function is also unknown, and they use to contain garbage from the time they were amortized.

We have few evidences to summarize the features of the habitat structures of these moments. The remains which are present in the archaeological record are fragments of mud with vegetal imprints and pole holes (See Figure 2). These materials are not allowing us make an estimation of the floors and dimensions of the houses. At the same time, it is difficult to estimate how many cottages would form the town, whose extension is defined by the dispersion of the structures in many cases.

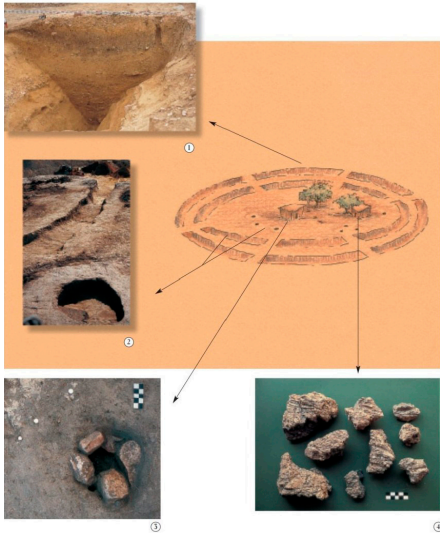


Figure 2. Ideal reconstruction of a III millennium BC settlement. 1. Niuet (Alqueria d'Asnar), ditch section; 2.Arenal de la Costa (Ontinyent), ditch and silos; 3. Arenal de la Costa (Ontinyent) Pole hole; 4. Benataire (Cocentaina) Mud with vegetal imprints (Bernabeu & Pascual 1998).

3. Aggregation

The silos settlement will be a constant in the archaeological register until the stone constructions generalization, around the second half of the III millennium a. C. This moment comes along with a qualitative leap in the domestic architecture, as a reflection of deeper social transformations.

From Bronze Age on, material and social transformations are radical. We can say, in this brief text, that from this moment on little villages and housing acquire a new visualization. The settlement pattern profoundly changes. The villages start to settle in the top of hills and mountains. It also acquires a tendency already present in other peninsular zones: the presence of stone as a construction material. This increment of work investment, tell us about certain will of staying in the territory. At the same time we can observe diverse settlement typologies, attending to their dimensions and location.

Domestic units present radical morphologic changes (see Figures 3 & 4). Opposite to the simple cottage habitat, free-standing and disposed in extension, rectangular or square floor housing appears. Their structures concatenate each other creating dense occupation units. Internally the habitational spaces are draft with partitions which compartmentalize space and the social life as well.

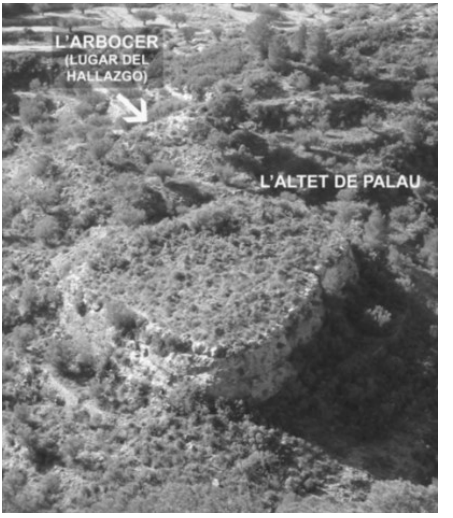
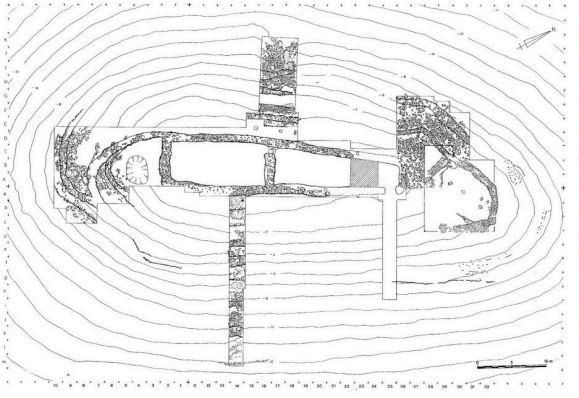


Figure 4. Tipical Bronze high site, Altet de Palau (La Font de la Figuera) (García et al., 2005).

This new way to understand the space that puts the accent in the fragmentation and the aggregation could be a reflection of deep social changes. The settlement pattern reflects an attempt to guarantee access to agricultural resources, and at the same time pursues a search for security. The magnitude of all these changes would be indicative of a new social reality in which the domestic unit would turn



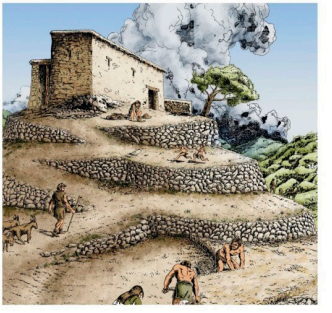


Figure 3. Floor and reconstruction. Lloma de Betxí (Paterna) (De Pedro, 1998).

into the main socialization space. We can not forget to mention that at this moment a new tendency appears in the funerary practices, and an important part of the deceased are buried inside some settlements.

Certain homogeneity is observed in all the Mediterranean façade in relation to the new settlement patterns. The Valencian Bronze Age shows features common to other peninsular areas. The extension of the settlements are considered smaller than in previous periods. There is also a clear search for high defensive potential places. Even sometimes the settlements have stone-made enclosures. Some of these elements affect to the general structure of the village, which can be organized in terraces used for agricultural purposes and domestic units setup (Raymond, 2004). This layout determines the display of the housing in right-angled rooms (see Figure 5) and little alleys. Also, some of the deceased are buried inside the settlements, or in the outskirts, forming what it is called 'integrated necropolis'.

this villages are slightly different to those used in the precedent phases. The stone will have a more relevant role and is used mainly to build dry fastened stone baseboards. The upper part above of the stone baseboard would use techniques inherited of previous moments and it would be formed by mud for the walls, while roofs would be built with wood beams and interlaced foliage. Floors continue being of tamp-downed earth and new structures show up attached to the walls, in the form of stone benches (see Figure 6) which sometimes contain holes to put pitchers or tubs.

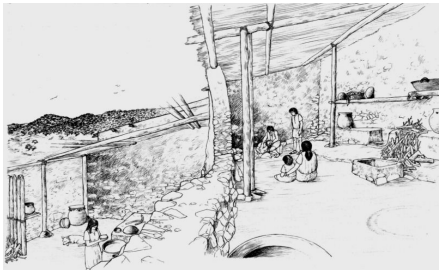


Figure 6. Cabeza Redondo (Villena), interpretation (Hernández et al., 2016).

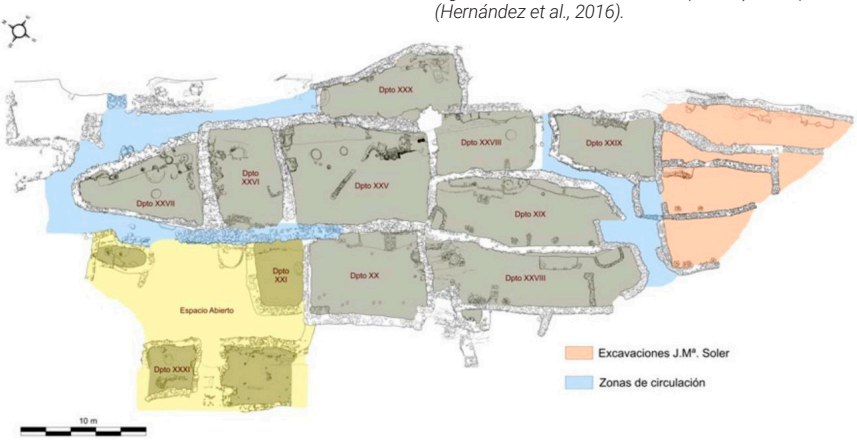


Figure 5. Cabezo Redondo (Villena) floor (Hernández et al., 2016).

The new way of understanding the space, increased the population density of the settlements, forming jumbled villages, articulated into a central street. The sharing of walls as support for one of the sides of the domestic unit reduces the work investment. The techniques used in the construction of

In relation to the settlement typology, it can be said that certain diversity exists. In the Valencian Bronze the villages were small. There were different sites typologies: from vantage points less than 100 m², hamlets of 100-500 m² to villages of 500-1500 m² (De Pedro, 2003). The different sizes could indicate certain territorial or

hierarchical organization, but also a different chronology. In general groups would be reduced in number and with an incipient social hierarchy. Although, complexity observed in some villages infrastructure, reflects the existence of a social structure able to organize the construction and maintenance works. Since the intensive survey projects have shown that settlement pattern gets more dens, it exists a huge quantity of fortified hamlets in which those groups develop their agricultural activities: Lloma de Betxí (Paterna), Muntanya Assolada (Alzira), Les Raboses (Sagunt), Orpesa la Vela (Orpesa), Altet de Palau (Font de la Figuera), among others. At the same time in the southern part of the Valencian territory, a series of larger size villages are standing out and are considered part of the Argar culture. They show more aggregation, and certain singularity in the material record. This features can be seen in sites such as Cabezo Pardo (Albatera), Cabezo Redondo (Villena).

4. Discussion

From the data we have nowadays, regarding habitat structures, we observe an increment of the density of the population in the territory. This process is followed by a increase in the density of the settlements, a reduction of the spacing between the domestic units, and a setting up of physical barriers which differentiate the spaces of some houses. Probably this is the moment in which we can start talking about an emerging urbanism in the Iberic Mediterranean façade, due to the presence of an early degree of planning. Therefore we can consider this moment the arrival point of this large evolution, which begins with appearance in the Iberic stage, of the Neolithic way of life.

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CHAPTER #4.02

DESIGNING IN THE LANDSCAPES OF ARCHEOLOGY

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1. Introduction

We could consider *ruin* and *architecture* two sides of the same coin, and thinking of one as the probable future status of the other, wanting to define the former architecture of a past time that now presents itself in the form of *ruin* or, even, of *remain*. Sometimes, some architectures have reached us in their completeness, often transformed in the form and/or functions (Duomo di Siracusa, Pantheon, Baths of Diocletian), remaining nevertheless *living architecture*, whose life is given by the uninterrupted use. The fortune of a monument in continuing to exist is, in fact, linked to the interest in it (which can be of a locational, structural or merely formal type) which guarantees the care of the men succeeded over time. Other times, the monuments are presented in the form of ruin, whose value is today linked to another type of interest that could be artistic, historical and documental, as well as archaeological; in this case they are often subject to musealization and contemplation. This ensures them to persist and *live not of their own life* but in relation to other factors; an existence closely connected to the memory and evocation of a past culture, now lost. But also, what remains of an architecture is only a remain, bare helpless, often isolated, of a body of which only a trace remains: *dead architecture* whose value is linked to the concept of sublime, to the emotional nature of its composition. In fact, "Death is inherent in men as the ruin is inherent in things" (Sartre, 1945, p.22), alluding to the analogy between the life of man and that of monuments, both subject to a condition of transience.
The first point of contact between architecture and archeology is the restoration project, most often aimed at resurgence and material, spatial and figurative conservation. However, architecture is "Able to provide a useful contribution not only to the preservation and interpretation of those assets, becoming fully part of the multi-secular evolutionary process of places" (Segarra Lagunes, 2017, p.9). It is called to respond to various questions, not only related to protection and conservation, but also to their reintegration into life (in the urban area, in the natural landscape), and also to interpretation according to a contemporary perspective, to the use by visitors. The task of architecture becomes that of ensuring its life and guaranteeing its survival, as a sign of an uninterrupted and ever-changing cultural heritage. This does not mean that we must necessarily preserve every architecture in its initial state: several times ancient monuments have varied in form and function, even though they present today the unity of their image; in the same way different archaeological sites have adapted their structures (accommodation and safeguarding the finds) to the modern needs of use.
But how can architecture act today on ruins or remains, often isolated and unrelated to the sphere of belonging, which do not present any form of tourist interest and for which functional use is impossible? Is it possible to bring *dead architectures* back to life?

2. Between past and present

There are many ways of operating architecture and we must take into account various factors. In archaeological contexts, the project becomes an instrument that brings together history and present, contemplation, function and fruition, building relationships with the surroundings in order to reappropriate the physical and cultural values of the context in which an artifact is inserted, as well as intervening to enhance and protect the good and the site itself. It is therefore necessary to reconstruct the area on which the archaeological artefact insists on the surrounding tissue and restore a spatial and conceptual (*temporal*) continuity. Architecture must take note of the ancient traces and the needs of today, through a design based on a correct interpretation of the original work, in order not to remove and erase the intrinsic values of the work itself and to establish in turn a continuity relationship between ancient and contemporary times. Each architecture,

because it belongs to time and space, to survive has to adapt to the different historical moments, to the changes in the surrounding landscape. If man is the cause of the functions linked to social changes, the landscape is the fundamental element to reconnect the origin of the work to the present. Through the study of the landscape, the architectural project has the potential to create new centrality or to ensure the fruition of a given archaeological site, returning to the present a work of the past. The landscape is therefore a decisive element for the project: urban development, often disrespectful of historical values, the growth and densification of the cities that sometimes incorporate the archaeological sites, have changed the surrounding elements, the panoramic views, the views. To identify new points of contact to which to attach oneself and new points of view towards which to turn, means in fact *updating* and re-contextualizing an archaeological artifact. Therefore, rather than limiting itself to the material and functional recovery of the artifact, it should be directed to an enervace aimed at restoring social and identity values linked to the historical find and the qualities of a particular place, so as to emphasize its character and guarantee its use. Having established the general characteristics of which architectural design must take into account, we can specify some modalities of intervention that differ in relation to the entity and type of ruin.

When working in or near an archaeological site that has monuments of particular value and historical interest, architecture assumes an auxiliary and filtering function. It will be able to mend the edges of the historical fabric with today's city, in general with the urbanized or natural surroundings, trying to ensure the physical and spatial continuity between the new and the ancient. This design mode can be defined *architecture for archeology*. In the same context, small architectures, contour elements (canopies, walkways, belvederes) can be generated, which, positioning themselves within the archaeological sites, are configured as modern signs within an ancient plot. It is *architecture in archeology*. Another case, contextually similar to the previous but opposite in the procedures, is the *architecture with archeology*, in which the first acts using the materials of the remains, the spaces, the footprints, integrated into a new idea. This is the reverse process of anastylosis, since, although using the material of the historical artefact, this is re-elaborated with contemporary forms and functions or in any case different to the original ones. In this context can be placed some interventions by Francesco Venezia in Gibellina, where the remains are found in the city destroyed by the earthquake; as well as the paths of the Acropolis of Athens designed by Dimitri Pikionis, in which the archaeological rests are used and integrated into the abstract design of the pavement.

On the contrary, when ruins or remains appear as isolated elements, detached from the physical and cultural context in which they were born, or devoid of any functionality (tourist or contemplative), configuring themselves as *dead architectures*, the project has an ethical and strategic role, beyond that compositional, in how much must surrender them to the man and to the contemporaneity, assigning to them a new *reason of being* (but always in agreement and in the respect of the archaeological traces) in order to bring them back to life. It is in these cases that architecture can *contaminate* archeology with modern forms, reinterpreting it, recontextualizing it, determining new centralities, in order to reestablish the values that time has canceled. It is possible to identify, also in this case, some ways of operating. We speak of *architecture inside archeology* when the ancient becomes a shell and a container, as well as a pretext, to establish new functions: architecture is configured as content and uses the ruin and its expressiveness as a characterizing element, insisting on inside of its own imprint to recover the collective memory of the site. The opposite way of operating is given by the *architecture around archeology (archeology inside architecture)* in which the rests, in the form of a fragment, are transformed into a document to which the architecture offers protection. It is architecture that becomes a container while archeology becomes the content. One example is the library of Ceuta, in Spain, by Paredes Pedrosa Arquitectos. Another case that arises from the need to protect archaeological rests is that of *architecture above archeology*. The project is mainly aimed at the conservation of the ruins (often of great extension, as theaters in natural slopes), sometimes proposing the restoration of the original function, sometimes favoring the museification. Simple shapes and neutral materials are preferred, often limiting the planimetric imprint. In other cases, as for the project of Franco Minissi for the Villa del Casale in Piazza Armerina, the forms of history

are used to allude, without ever recreating them, to the forms of the original artefact, through an ephemeral structure and techniques deliberately belonging to the contemporary.

3. Projects

Some author's projects in Sicily exemplify the modalities of intervention specified above, concerning respectively the cases of *architecture for archeology, architecture in archeology, architecture inside archeology.* In the heart of the Valley of the Temples of Agrigento, the redeployment project of the *Piazzale Hardcastle and of the Refreshment stand* (2017), between the rests of the Temple of Olympic Jupiter and the Temple of Hercules, is a convergence of paths, but also a knot of interchange and identifying place of the entire Archaeological Park. Despite its privileged position, the *Piazzale* is now manifested as an isolated object (alien to the archaeological and landscape system) and without a suitable functional program. To this end, the project aims to build relationships with the surrounding area through the enhancement of the surrounding heritage and the enhancement of tourist services, with dining, service, cultural, exhibition, restoration laboratories and a new, monumental entrance to the an archaeological area that restores physical continuity with the Temple of Jupiter. The project, working with *excavation* and *subtraction*, introduces new directionality: the square as well as moving towards the adjacent temples, turns towards the contemporary city, with the aim of reappropriation of the physical and cultural values of the context but also to include the city in it of Agrigento, restoring the dialogue between past and present. In the new configuration, the square exploits its central position as a physical, cultural and tourist barycenter of the entire park, with the ultimate aim of returning to the city of Akragas the new altar of the Temple of Jupiter and the new square-agora for travelers of the Valley.

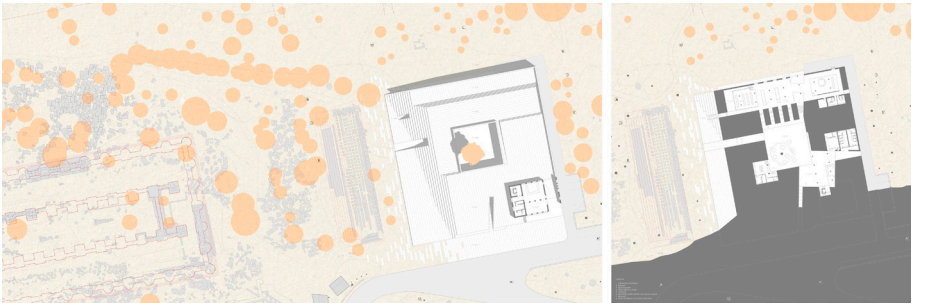

Figure 1. Plans of the redeployment project of the Piazzale Hardcastle. Source: L.S. Margagliotta (2017).

Figure 2. View of the redeployment project of the Piazzale Hardcastle. Source: L.S. Margagliotta (2017).

Also in the Valley of the Temples, the project of the belvedere to restore the point of view of the *Situation of the Temples of Agrigento* (2018) comes from the desire to resume the perspective that the English designer John Goldicutt has made in 1817. A system of jutting plates (with steel structure) are articulated organically following the natural directions of the overhanging rocky ridge, to which they hang, remaining suspended in the air with principles of lightness and essentiality. The intervention can be considered minimal, as it is resolved in an imperceptible modern sign from the archaeological area surrounding the temples, but clearly visible and recognizable on the side near the Sacred Hill, from which it is presented with white slabs that fit into the wall of calcarenite from the intense yellow-gold color. Combining in a unique new and ancient perspective represents an attempt to organically solve that difficult dialogue between archeology and architecture that come together again at the same time and in the same space. Moreover, in relation to the different altimetric points in which it is stationed, the ramp system offers an ever-changing view of the relationship between the Valley of the Temples, the natural and urbanized landscape and the horizon line of the sea that concludes the extensive western view.

Figure 3. Drawings of the project of the belvedere in the Valley of the Temples. Source: L.S. Margagliotta (2018).

Figure 4. View of the project of the belvedere in the Valley of the Temples. Source: L.S. Margagliotta (2018).

Lastly, the project on the remain of the church of San Benedetto (2018), in Caltabellotta, proposes the revaluation of what remains of the IX century artifact. and of the site where it is located. The rests, in a state of abandonment, are configured as isolated elements and devoid of any historical and functional attention. The project proposes the insertion inside (without ever touching it) of the planimetric imprint of a white polycarbonate structure, which will be illuminated at night by investing the stones with a new light and a new interest. The new structure, taking up the geometry of the nave and the step of the buttresses, alludes with its peaks to the shape of the Caltabellotta landscape: turning towards the modern city, the ancient exploits and relates to the new, acquiring the signs of contemporaneity. The new function is that of a terrace on rediscovered panoramas, a base for day or night events; all wrapped up in the mountain range that returns inside the remain and becomes a microcosm in the structure itself. Once again the landscape becomes a resolutive element to unite, through a modern sign, past and contemporaneity.

Figure 5. Plans of the project on the remain of San Benedetto church. Source: L.S. Margagliotta (2018).

Figure 6. View of the project on the remain of San Benedetto church. Source: L.S. Margagliotta (2018).

4. Conclusions

The three projects, although intervening in different contexts and scales and with different main purposes (of functional enhancement the first, of complement the second, of recovery and enhancement the third), express an univocal way of working, in which the new never prevails on the ancient, but one in which one draws strength and vitality from the other.

Even an architectural sign, like regain a view or reorienting it towards a new view, means connecting the contemporary landscape to the archaeological fabric, which will live not only in relation to itself but also to the surrounding context (natural or urban), sharing looks and, therefore, relationships. As the places of the present must accommodate the landscapes of archeology, in the same way it is also necessary that the ancient accept and draw from the landscapes of modernity. In this way it becomes possible to generate a two-way relationship between past and present, in which the new becomes part of the old and vice versa: introducing and contaminating the ancient with modern values to reintegrate it and return it as integrated architecture and reacquired to today's city.

Building and "Reconstructing means - in fact - collaborating with time in its aspect of the past, grasping its spirit or modifying it, extending it, almost, towards a longer future" (Yourcenar, 1951, p.134); so planning in the landscapes of archeology means understanding the character of the place, looking for new signifiers and uniting them with the old ones, integrating fully into the evolutionary process of places. Designing on an archaeological rest means working on it and the place to which it belongs, trying, even through a single architectural element, to restitute to man and the city what for man and the city had been built.

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CHAPTER #4.03

TERRITORIAL PROTECTION APPLIED TO CULTURAL HERITAGE: CHALLENGES AND OPPORTUNITIES. THE CASE OF THE CULTURAL PARK OF VALLTORTA-GASSULLA (CASTELLÓN, SPAIN)

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1. Introduction

The evolution of the traditional concept of artistic heritage as a set of objects or traditions to a broader concept such as cultural heritage, has undergone changes of form that now include particular types of heritage, such as the Landscape and by extension the Cultural Landscape, where the relationship between man or society and nature is present.

This heritage dimension of the landscape is currently supported by international organizations such as UNESCO (adopted this category in 1992), International Union for Conservation of Nature (IUCN), the Council of Europe, and international documents such as the Krakow Charter 2000 or the European Landscape Convention. They established a new relationship between culture and nature heritage, and identified a new category, the Cultural Landscape or the Protected Landscape (in the side of the natural heritage). These two categories are similar in aspects of landscape and man-nature relationship, differing in the interest in the human, cultural or social aspects of the Cultural Landscape compared to the biodiversity and natural values of the first.

The regulation of this heritage has been done unevenly; while for the natural heritage, there is a uniform implementation even at European level with a strong tradition and acceptance by society, not the same with cultural heritage with few exceptions. Currently, it is beginning its development with figures of management and land use planning of the cultural landscape.

The term Cultural Park is used to designate and delimit the territory that forms the cultural landscape. It is, therefore, according to Sabaté (2007) an instrument of development of the cultural landscape, which contemplates the organization, protection and management of the whole, emulating to natural parks but with an important sociocultural component. This is the way followed by the National Park Service of the United States of America or by the Australian Government that use the category of 'protected landscape' in their legislations.

In Spain, the Cultural Park appears, as a legal figure for the development of the cultural landscape, at the sectoral and regional level. The cultural landscape is included in the legislation of the Autonomous Communities in two ways, as a category of asset of cultural interest (in each community is named in a different way), and a second one, more developed, as a figure of integral territorial management of this cultural landscape. The region of Aragón was a pioneer in regulating this category. Afterwards, Law 4/1998, of the Valencian Cultural Heritage, was developed. This Law creates a similar figure to the National Asset of Cultural Interest (CANI or BIC in Spanish), that is the Cultural Asset of Valencian Interest (CAVI), and, among its categories, expressly includes the 'Cultural Park'. The Law defines this category as:*"the space that contains significant elements of the cultural heritage integrated in a physical environment relevant for its landscape and ecological values"*.

2. Features of the Valltorta-Gassulla Cultural Park

The Valltorta-Gassulla Cultural Park (Fig. 1) includes eight municipalities in the province of Castellón: Ares del Maestre, Morella, Catí, Tírig, Coves de Vinromà, Albocasser, Villar de Canes and Benassal. This park is characterized, firstly, by the important archaeological heritage

it contains, both for the number of rock art paintings (more than 1,000 figures), for the archaeological sites (122 caves and shelters), and for its density (Martínez Valle, 2000). The rock art paintings date from the 8000 BC to 5000 BC and are the result of itinerant people dedicated to hunting and gathering activities, living in caves and shelters (Fig. 2). Additionally, there is an ethnological heritage (dry stone popular architecture, pre-industrial and rural architecture) that characterizes the landscape, framed in a natural Mediterranean environment of great ecological value.

This important archaeological heritage, along with other Spanish sites (727 sites of 6 regions), was declared in 1998 as a World Heritage Site by UNESCO (criterion iii), as part of the 'Rock Art of the Mediterranean Basin on the Iberian Peninsula'. Moreover, it is considered as one of the most important outdoor rock paintings site worldwide.

The thematic figure that represents the repertoire of Levantine Rock Art is the archer and the hunting scenes Fig. 3). There are also isolated representations of zoomorphs such as deer, goats, bovines, wild boars and horses, or archers or men in scenes of struggle or dance of marked social and ritual character, and gathering representations, female figures, etc.

With the approval of the Valencian Decree 168/2016, of 11 November, of the Consell, the first Cultural Asset of Valencian Interest under the category of 'Cultural Park' has been designated. This asset is the Valltorta-Gassulla Rock Art Area.

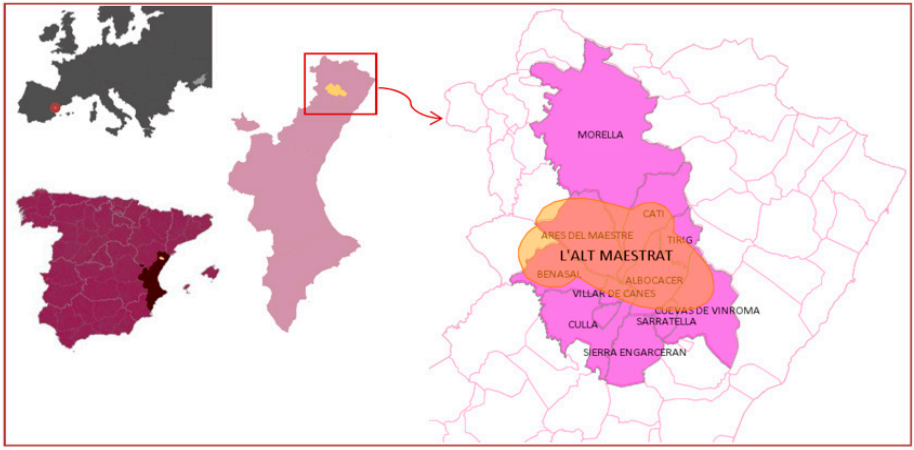

Figure 1. Map location of the Valltorta-Gassulla Cultural Park (Castellón) and involved municipalities. Source: Orts (2013).

Figure 2. Cova dels Cavalls (Tirig, Castellón). Source: Orts (2013).

Figure 3. Figures of archer, climber and wild boar in Mas d'EnJosep (Tirig, Castellón).Source: Orts (2013).

This work aims to identify the opportunities for the conservation and integral protection of this territorial cultural heritage, and challenges derived of the application of this Law. For this purpose, a review of the different legal regulations concerning cultural and natural heritage, territorial planning and landscape, at international, national and regional level, has been done.

3. Sector-specific regulations related to the Valencian Cultural Park

The Valencian legislation on cultural heritage began, as it has been mentioned, with the Law 4/1998, of June 11, of the GeneralitatValenciana, of the Valencian Cultural Heritage. It was modified by Law 7/2004, of October 19, of the Generalitat. The modifications include the requirement of a Special Plan for the CAVI categories. Later, another important modification is registered with Law 5/2007, of 9 February, of the Generalitat, and thus the category of Cultural Park is included in its Chapter III of the Valencian Cultural Interest assets (Art.26,1h) as Casar (2009) mentioned. The last modification was Law 9/2017, of 9 April, giving entrance to the historical memory in the Valencian cultural heritage legal framework.
The legal figure of the Cultural Park, as it happens with the rest of the CAVI categories of the Valencian Heritage Law, does not have a regulatory development, although there are tools in the legislation that allow configuring a basic legal framework. Nevertheless, at the present time, as Casar (2008) stated, it will be the Decree of the Consell designing the Cultural Park dated in 2016, the prevailing normative until the existence of a Special Protection Plan[1] . The Cultural Park, as already mentioned, is considered as an immovable asset; the figure is established only from the point of view of protection, not as a management figure. Therefore, its development is limited to a Special Protection Plan that is thought more for an urban environment.

There is a whole corpus of sectoral rules and regulations interrelated in a direct or indirect way with the figure of protection and management of the Cultural Park (Casar, 2008). Thus, together with the cultural ones, landscape and environmental regulations are the main norms for a Cultural Park.
The basic normative of the landscape in the Valencian Region is the Law 5/2014, of July 25, of Territorial Planning, Urbanism and Landscape (LOTUP), which replaces and repeals the previous Law 4/2004, of June 30, of Territorial Planning and Landscape Protection, and also Law 16/2005, of 30 December, of Urbanism, and Law 10/2004, of Non-developable land.
The new Law introduces the concept of 'Green Infrastructure' and, among the spaces that it integrates in its Art.5 are: i) Areas of landscape value included or declared as such in the Territorial Strategy of the Valencian Region, in the instruments that they develop it, or those incorporated into planning using the proper tools of landscape land use planning and management defined in the following article; and j) Areas of high cultural value that have this consideration in application of the sectoral regulation for the protection of the cultural, artistic or historical heritage, including its protective surroundings.
As for the natural heritage, it should be noted that it has the greatest number of regulations. On the one hand, there are the European regulations (Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, Directive 79/409/EEC relative to the conservation of the wild birds), the national ones (Law 42/2007 of Natural Heritage and Biodiversity), and Law 11/1994 on Natural Protected Areas of the Valencian Region. This regional Law defines seven distinct categories of protected natural space and, among them, is the 'Protected Landscape' which is a figure similar to that of the Cultural Park. For Protected Landscapes, are foreseen Uses and Management Master Plans (PRUG plans).

[1]This is established in the Valencian Cultural Heritage Law, as follows: *"Art 39.4. Historical sites, archaeological and paleontological zones and cultural parks will also be ordered through their corresponding Special Protection Plans or other management instruments that meet the requirements established in this law".*

In addition, it is Law 43/2003 of Forestry and Law 10/2006 that modifies the previous one, and also Law 3/1993 of Forestry of the Valencian Region, with its corresponding Forestry Territorial Action Plan of the Valencian Region[2].

4. Designation of the Valltorta-Gasulla as a Cultural Park

The CAVI are assets of special relevance because of their cultural values; therefore, require, according to Valencian regulations, a formal declaration, which means that they enjoy a special protection reporting in that sense certain benefits but, at the same time, also certain limitations[3] .

For the planning and management of a Cultural Park, the legal figure of the Special Protection Plan is available, as seen. Although it is more of an urban scope, it could develop the land use planning tools if necessary. One drawback of this formula is that each cultural park in the Valencian Region may end up being ordered differently, thus denaturing the logic of the legislator when creating a homogeneous figure for the Valencian Region. This situation presents a legal uncertainty because they are figures of supra-municipal scope and almost of territorial planning with social and cultural components. The Law does not contemplate these terms and this makes it difficult to fit them in a Special Plan of urban nature.

The present regulations of protection will govern transitorily until a mandatory special protection plan or similar document is provided, and this reaches patrimonial validation, in accordance with what is established in articles 34.2 and 39.4 of Law 4/1998, of 11 June, Valencian Cultural Heritage. With regard to the content of the Special Protection Plan for the Valltorta-Gasulla Cultural Park, it should contemplate the land use planning and management of the natural setting, of the architectural and cultural elements, and of the traditions and other intangible issues. It must also establish global and permanent aspects of park management such as zoning, infrastructures, basic services, regulation of uses and activities, among others.

5. Discussion and conclusions: Challenges and opportunities for the Valltorta-Gassulla Cultural Park

From the cultural perspective, the implementation of this figure of Cultural Park is not exempt from difficulties, since in most cases they are authentic figures of territorial planning (natural parks, but with additional cultural protection), including a supra-municipal area, and an overlapping of competences among the different administrations, in addition to a lack of social awareness (Orts, 2013).

The lack of a specific regulation means that the designation of a Cultural Park with provisional protection norms and a Special Plan for its implementation is not homogeneous in all the places where it is applied.

On the other hand, we must remember that it will be necessary to articulate a participatory process to give access to all possible stakeholders.

Regarding opportunities, it should be noted that the enhancement and development of a cultural landscape, under the figure of Cultural Park, is seen as a strategy for the local sustainable development, especially linked cultural tourism activities. This strategy, as pointed out by Viñals et al. (2017), is driven by the European Structural and Investment Funds (ESIFs), in line with the aims and application of the Europe 2020 Strategy (European Commission, 2010). Bearing in mind that this Law develops the guidelines of the European Landscape Convention, and that 2018 has been declared as the European Year of Cultural Heritage.

Moreover, this declaration will respond to a requirement of UNESCO, which is that the World Heritage sites need for a Protection Plan that ensures the conservation of the property and a sustainable use of it.

It would also be desirable to consider the regulation of tourist visits based on a Public Use Plan or a Uses and Management Master Plan (PRUG).

[2]DECRETO 58/2013, de 3 de mayo, del Consell

[3]Formarán parte de la Sección Primera del Inventario General de la Comunidad Valenciana (dependiente de la Consellería competente en materia de cultura).

In addition, it is necessary to consider that the tourist visits to this Valltorta-Gassulla Cultural Park will facilitate the knowledge of this cultural heritage and this can become a tool for raising awareness about the conservation and protection of the environment and culture.

Currently, there are several caves and shelters ready to receive visitors: Coves de la Saltadora, Cingle de Mas d'enJosep, Cova dels Cavalls, Coves del Civil, Cova Centelles, Cova Remigia and Morella la Vella. There is the possibility of increasing the number of visitors, but in order to respond to this potential demand, it is necessary to organize well the sites with facilities (routes, signage, interpretation means, etc.), and tourism service providers (hotels, restaurants, tourism companies, etc.). Moreover, the limits of resources must be established (maximum number of visitors with studies of Recreational Carrying Capacity), and also adequate tourist activities must be identified.

As a final reflection, we must remember that this will be the first experience in the application of the figure of the Cultural Park, which will entail an integral organization of a territory based on an articulated protection and promotion of cultural heritage within a framework of social participation, and under the principles of social cohesion and sustainable rural development. Therefore, it is very important how it is going to be done, as it will guide the future of the designation process of other Valencian cultural parks.

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CHAPTER #4.04

SEARCHING SPATIO-TEMPORAL PATTERNS IN URBAN AREAS, USING ARTIFICIAL NEURAL NETWORKS

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1. The City as a Holistic System

Each city, built from its different urban layers: public spaces, facilities, parks, transport networks, housing, etc. constitute a paradigmatic example of a 'Complex System'(Figure 1). In the course of the 1940s 1950s, Warren Weaver was the first to introduce a useful distinction between Simple System and Complex System: Weaver (1948). What characterizes a complex System is essentially that they are made up of large numbers of parts- and that these part are strongly connected; that is, they each interact strongly with a number of others: Wilson (2000). In addition to its complex nature, the city should be understood as 'A system as a whole' -is not an object but a way of looking at an object. It focuses on some holistic property which can only be understood as a product of interaction among part-: Alexander (1968). We consider an holistic behavior when the whole System is affected by changing one of its parts. This way of understanding the concept of System is distinguished from the meaning 'A generating system' -is not a view of a single thing. It is a set of parts, with rules about the way these parts may be combined-. A particular case of this last meaning are the formal systems of mathematics, where the numbers, variables, etc. are the parts of the System, and mathematical expressions shape the rules that determine how those parts should be combined. In the case of cities, these two meanings are irremediably linked. In order to guarantee the character of the holistic system of the city, it is necessary to configure generating systems that provide rules and laws to each of the parts of the city. Forming, in this way, the holistic System properties necessary for its own adjustment: Alexander (1968). From this point of view, we can define the city as a 'System that generates Systems'.

Figure 1. The city of Valencia seen from over 300 km above Earth. Source:ESA/NASA(2013).

2. Models: Simplifying the urban space system

Let's start with a simple example: imagine the brick walls of a house, built with a particular composition, on which rests a concrete slab that transmits its loads and, at the same time, configures a specific space based on the realative position of these elements with each other. Also, add the changing light during the day, defined by the orientation of this set with respect to the Sun. Finally, consider other non-physical parameters such as the social relations of the inhabitants of that space, the economic conditions of the city where it is located, its Political System, etc. As we add parts to the System and establish new relationships between them, the System described begins to be defined as a complex System. Despite its complexity, architecture is able to abstract and simplify this system through drawings, diagrams and models that -start from a mental process and try to interpret reality by reducing contexts of increasing complexity and visualizing flows, matters and phenomena of reality that they do

not have a precise figure-: Montaner (2010). In the huge context of the modern city, these urban models must invariably be implemented in the computational environment, transferring the theory in a way that is testable and applicable through experimentation. In this sense, computers act as the laboratory of urban experiments before materializing in the city. Actually, Michael Batty defines 'Urban modelling' as the process of identifying appropriate theory, translating this into a mathematical or formal model, developing relevant computer programs, and then confronting the model with data so that it might be calibrated, validated, and verified prior to its use prediction". In the following image (Figure 2), we can see the correspondence of the urban growth of Athens comparing the prediction map of the model and the real urban map: Triantakonstantis et al. (2015).

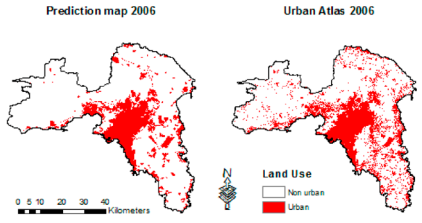

Figure 2. Comparison between prediction map for 2006 derived by the urban growth model and Urban Atlas real map of 2006. Source: Triantakonstantis et al. (2015).

3. Definition of spatio-temporal patterns

One way to approach the complexity of the city is the search for entities and relationships between them that are repeated in a cyclical way over time. To these entities, C. Alexander defined them as patterns: 'Each pattern describes a problem that arises again and again in our environment': Alexander (1977). "Is a discovered solution that has been tested for some time, and under varying conditions. For architectural and urban patterns, the time-frame can be several millennia. A pattern is not usually invented, so creativity is subordinated here to scientific inquiry and observation." (Salíngaros, 2000). In his book "A pattern language", Alexander will build a sequential mesh through the definition of 253 patterns and their intrinsic connection. This set of patterns are divided into 3 categories: City (1-94); Building (95-204); Construction (205-253). If we analyze, for example, the pattern number 11 - Areas of local transport - (Figure 3) we see that it is proposed to decompose the urban area into local transport areas of between 1.5 and 3 km, and these are surrounded by a bypass road. At the same time, there is a network of smaller local roads for internal movements (on foot, by bicycle or local vehicles) and some main roads that facilitate the entry and exit of cars and trucks from the bypass road.

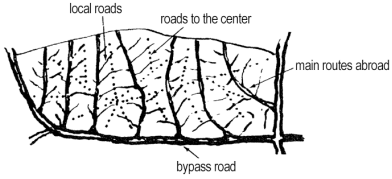

Figure 3. Pattern 11: Areas of local transport. Source: Alexander (1977).

It is a 'spatial' pattern. It draws and determines the 'form' of the city, however, it does not give us 'temporary' information. It does not define the 'growth'. The 'form' of an object is defined when we know its magnitude, real or relative, in several directions; and 'Growth' implies the same concepts of magnitude and direction, related to the additional concept, or 'dimension' of time: Thompson (1942). In terms of the city, where transformations take place 20-30 years after, it is not enough to establish spatial patterns and describe their form. It is necessary to define spatio-temporal patterns, which at the same time build their form and growth.

4. Recognizing patterns using Artificial Neural Networks (ANN)

The search for urban and architectural patterns is born of a meticulous process of observation, data analysis and study of the complex system of cities. Currently, for this purpose, the Artificial Neural Networks (ANN) are powerful tolls that use a machine learning

algorithm in order to model complex behavior: Triantakonstantis (2015). We can define an ANN as 'massively parallel interconnected networks of simple (usually adaptive) elements and their hierarchical organizations which are intended to interact with objects of the real world in the same way as biological nervous systems do': Kohonen (1988). Firstly, the ANN receives input elements (stimuli: 'input neurons'), then the neuronal network processes them (learning: 'hidden neurons') and, finally it returns some output parameters (response: 'output neurons'). (Figure 4)

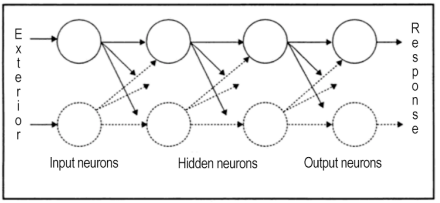

Figure 4. Types of artificial neurons. Source: López et al (2008).

Within the types of neural networks, the most used are networks with multiple layers: "MultiLayer Perceptrons" (MLP). In urban processes, different types of neural networks have been used, such as 'ART-MMAP': Liu et al (2008); 'SLUETH': Clark et al (1997) and 'SOM': Diappi et al (2004). In the search for urban patterns we are especially interested in neural networks "Self Organizing Map" (SOM): Ritter (1989), for its ability to map an organized structure of patterns with unsupervised and competitive learning: Abarca et al (2013). In a very summarized way, this type of networks work in the following way: From the data of multiple spatial, temporal, social variables, etc. that qualify the architectural elements (development potential, plot surface, occupation, uses, revenues, urban growth etc.) the input elements are formed. By means of these input variables, the neural network itself will establish relationships and expurgate those elements that are not related to each other. These variables are organized, later, by affinity through a cartography where the degree of relationship and intensity of the different parameters can be observed. At this time, you can get the first cause-effect relationships and establish patterns. The network continues learning and repeats the process eliminating the variables that do not provide coherence in the formalization of the patterns until obtaining the final SOM map: Abarca-Álvarez (2011).

This type of procedure achieves its goal efficiently, however, it has the structure of "black box" where, sometimes, you can not get to understand well what happens inside the neural network: Cherkassky et al (1994). Despite this uncertainty, the structures returned to us by the neural network are easily contrasted with reality. And they have been demonstrated by simulation in comparison with other statistical models of multiple regression, discriminant analysis and logistic regression in the prediction and classification, obtaining a performance of the models based on neural networks similar or superior to the statistical ones. Pitarque et al (1998).

5. Conclusions

Ultimately, this research seeks to establish a methodological field for the study and construction of the city. This city, defined as a complex and holistic system needs to be understood from urban models that allow us to make predictions in a more accurate way. Through the careful analysis of the urban system we can establish patterns of space (form) and time (growth) that help us understand and project the future city. Finally, the enormous possibilities offered by the Artificial Neural Networks (ANN) to achieve this goal and configure the city as a whole have been demonstrated.

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CHAPTER #4.05

PHYSICAL AND SOCIAL ATTRIBUTES IN THE URBAN IDENTITY. ANALYSIS OF THE RESIDENTS' PERCEPTION OF VALÈNCIA (SPAIN)

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1. Introduction

This research paper presents the preliminary results of a larger project whose main objective is to identify the identity of the city of València for tourism purposes. The first step has been to know what defines identity in the case of urban studies, and secondly to address what Valencia citizens think about its own city and how they perceive it in order to define the urban identity from the locals' point of view .

The concept of urban identity is a recurring issue shared by architects, urbanists, landscaping and heritage researchers, geographers, sociologists, as well as tourism researchers. In general terms, authors agree that the identity concept focuses on the "uniqueness" of an object, a setting, a person, or a society that provides them "distinctiveness". Moreover, identity is characterized because it involves interaction with others (the "self" in relation to "other/s"), and it is never a stable construct; on the contrary, it is continuously evolving. Castells (1998) stated that identity is a continuous process through time, in which societies process the elements offered by the context and reorder them, imprinting them with particular characteristics.

Many authors have addressed the specific topic of urban identity. Among all of them, Kevin Lynch stands out as he was the pioneer in this field since the 1960s of the past century. Lynch (1960) conceived, in the spatial planning and design, a comprehensive vision of urban identity, focusing his work on the image analysis of the city. One of the most complete definitions of urban identity is that of Aguilar (2002), which states: *"It is a collective construction over time and with spatial repercussions. This construction is based on the existing social relationships of a specific territory that have certain geographical features. They result in different spatial evidences reflecting the consistent relationship and dependence between the physical setting and the cultural, social and economic expressions of a human group"*. The definition of the concept is completed by the inclusion of a series of components (attributes, characteristics, qualities, associations, values, etc.) that are an intrinsic part of it, and differentiate a city from others (Ünügür, 1996; Ilgın, 1997; Shuhana, 2011). This cognitive approach is necessary in order to know and to feature the spatial, physical and social elements of a city; but, as Órer (1993) and Çöl (1998) pointed, a meaningful urban identity is established from the interactions of people with their environment. Therefore, as Hashemnezhad *et al*. (2013) stated, this phenomenon involves behavioural (functional relationships between people and urban), and emotional processes (meaning of places, satisfaction and attachment to place). Fridmann (1995) stressed the importance of time as a factor influencing the construction of the urban identity concept. Thus, he wrote about three moments: past (historical or inherited identity), present and future (projective identity).

In this context, it is now worth to consider the urban identity components. A comprehensive vision of urban identity starts with the analysis of the image of the city. In relation to the urban image, Lynch's theory (1960) suggested five physical types of elements: paths, edges, districts, nodes, and landmarks that relate the visual quality of the urban environment to the mental image of its users (according to their knowledge, experience or familiarity with an urban setting). These qualities are used as generalities in the process of navigating in the

urban environment and used as a guideline for this work.
The core contribution of this paper consists in identifying the main physical and social components of the urban identity analysis and the urban perceived identity of the València residents.

2. Research Methodology

Methodologically, this study has focused on an image and identity analysis of the city. First, a bibliographic review about urban image and identity has been done in order to establish elements, factors and parameters to design the analysis framework. Second, an analysis of the former research findings concerning the image and identity of the city of València. Finally, a self-perception questionnaire survey addressed to the inhabitants of the València city was contducted, whose results were discussed with a panel of experts. This last analysis was based on the Self-perception Theory (Bem, 1967), stating that people sometimes develop their own attitudes by observing their own behaviour. Survey was carried on from May to July 2018, through questionnaires to citizens who lived in València for a long time. A number of 230 valid questionnaires were completed during this preliminary study approach. The survey was conducted in person and online, with 48 questions in thematic blocks. The first block refered to socio-demographic profile, other were focused on the perception of physical and socio-cultural qualities of the urban identity attributes , and last blocks were dedicated to obtain additional specific information such as residents' use of leisure time or their sense of place.

3. The city of València

The city of València is located in the eastern coast of Spain, alongside the Mediterranean Sea. Its climate is very pleasant with smooth winters (average of 13°C) and warm summers (average of 27°C), 2,600 hours per year of sunshine, and only an average of 44 precipitation days per year. Landscape is characterised by its low-lying flat coastal plain that gathers large beaches and an important freshwater coastal lagoon in the southern part of the city (Albufera de València). The Túria River, that irrigates the rich floodplain croplands close to València, ran through the city until 1957, when a huge flooding occurred. After this episode, the city was subject to great transformations; the river flow was diverted outside the city, and the old river bed was transformed into a green corridor for recreational uses. The restoration of the historical centre started in the 1980s and, at the same time, the Port experienced an important growth due to container traffic, which positions it as one of the most important commercial ports in the Western Mediterranean.
The city was founded by Romans in 138 BC, Moors inhabited València from 8th to 13th century, when the Christian king James I of Aragon conquered the city. The golden age of the city was during the 15th century when the economy flourished due to agriculture and maritime trade; València was, in that period, one of the most influential cities on the Mediterranean. Many emblematic buildings were constructed during this period (Cathedral, Serranos and Quart Towers, Silk Market, etc.) and in the following century, under the Renaissance style (Palau de la Generalitat). Baroque, Enlightenment and Modernism styles have also important artistic manifestations in the city (San Nicolás Church, Marqués de Dos Aguas Palace, Train Station, Central Market, Colon's Market, among others). At the end of the 20th century, it was inaugurated the City of Arts and Sciences, an iconic building of the avant-garde modern architecture designed by Santiago Calatrava, a Valencian architect. This information may be analysed in detail in the work edited by Dauksis and Taberner (2000) that shows the physical transformations held in the city along time.
This historical evolution left its artistic, architectural, and urbanistic footprint in the city and has also contributed to the development of a unique social identity. Currently, València is the third city of Spain in size (798,538 inhabitants in January 2018), and is the capital city of the Valencian Region.

4. Results

After a critical review of the existing scientific literature about urban identity components, some issues emerged. In general terms and depending on the field of specialization of the authors, greater attention is paid to the physical components or, on the contrary, to the social ones. Neverthless, there are, many works dedicated to the sense of place and place attachment; but there is also a lack of clear response to how these aspects interact to create the identity of a city. One of the contributions of this paper is the analysis framework, a multi-dimensional table where the diverse key components of the urban identity analysis are classified in ordered hierarchies (Fig. 1).

The physical setting refers to the space, physical forms, and appearance or urban landscape features. It presents the basic cognitive elements to perceive the city, and consequently, the first mental approach to an urban image. The analysis of physical setting considers two parts: the natural elements or attributes and the artificial ones (following Lynch, 1960).

In relation to prior research findings about the València's urban image and identity, there are academic works of urban analysis from different perspectives. Boira (1992; 2016) and Prytherch and Boira (2009) are concerned with the perception studies of the city while Puche and Obiol (2011) focused on identity. Other approaches are geared to social issues such as those of Rausell (2006), Santamarina and Moncusí (2013) and Santamarina (2014). Gaja (2010) analysed the Ciutat Vella district from the urbanism perspective. The similariest work to this research was published by Morales (2015), who presented the results of theValència's perceived space by college students.

Finally, the preliminary results of the survey, show that perception of the physical setting context, strongly affects how the locals make use of the city. Concerning the València's natural attributes, most opinions expressed that climate (90,6%), sunlight (70,3%) and geographic location (coastal plain beside the sea, etc.) (71,9%) where the most important natural attributes of the city, followed by landscape and greening. That is reasonable because the city has an outstanding and liveable geography. When residents are asked about what they like of living in this city, they reiterate the physical attributes mentioned above. Nevertheless, when they can express freely why, they spontaneously point to quality of life in more than 36% of the responses, to comfort (by means of size and scale of the city) in almost 31%, followed by quality of life (literally expressed) in 9,3% of the responses, and safety and tranquillity in 10,3%. Among residents' natural favourite settings (86,2%) and among all those elements that shaped the life of residents (30,0%), there is one that repeatedly appears: The Túria River Green Corridor.

Related to the artificial components, the outstanding artificial components of the city are, first the UNESCO World Heritage Site of Silk Market (72,9%), located in the historical centre, followed closely by built heritage of the Modernist period (71,9%). These two groups of built heritage are the iconic urban elements for residents; but public urban spaces (62,6%) have strong weight for them, not as iconic elements, but as common places where they share time with other residents, family and friends.

The second components of the analysis, socio-economic and cultural, refer to social attributes urban economic activities and services, urban cultural components, and citizens' social personality traits. In the survey, there were some questions to identify social activity, uses, practices, behavioural patterns and lifestyle, and the experiential qualities or social interactions that the residents have with the space or among them. Also, surveyed people were invited to identify local historical events that under their opinion, had shaped the image or the identity of the city.

Concerning the social uses, practices, and behavioural patterns, the three most important social attributes that configure city's identity are gastronomy (75%), the quality of life (72%) and traditions and festivities (71%). These results correspond with the answers that residents provide when asked about what they like to do while spending free time in the city. They rate city rambling (80,9%), go out for 'tapas' (62,6%) and to have leisurely lunch/dinner out (59,1%) as their favourite activities.

URBAN PERCEIVED IMAGE

PHYSICAL SETTING

Natural attributes

(space, physical forms and appearance or landscape features)

- ***Geographic locational features*** (latitude, altitude, etc.)
- ***Geological structures and landforms*** (valleys, water bodies, hills, natural hazards, etc.)
- ***Topography***
- ***Flora and fauna***
- ***Climate*** (temperature, humidity, precipitations, sunlight, fog, clouds, wind, etc.)
- ***Sensory attributes*** (visual attributes, soundscape, clean air, olfactory attributes, tactile attributes, etc.)
- ***Landscape features*** (composition, viewsheds, vistas, visibility potential, texture, visual appeal, etc.)

Artificial Attributes and Components

- ***Spatial form***

  Size, shape, height, skyline, movement, materials, condition, openness, spaciousness, enclosure, green and water coverage, type of architecture, amount of vertical buildings, density and placement of buildings, etc.

- ***Landmarks***

  Heritage elements:
  - Built heritage elements (public civil buildings, residential buildings, religious constructions, defence constructions, funerary constructions, historic sites or places and commemorative elements, etc.)
  - Archaeological heritage elements (site, areas)

  Technological centres, Engineering works and Modern Architecture

  Cultural outstanding facilities (museums, theatres, performing centres, concert halls, botanical gardens, multimedia centres, etc.)

- ***Paths, Districts and Nodes***

  Urban elements:
  - Districts (historical centre, maritime district, etc.)
  - Public spaces (squares, gardens, streetscape, green corridors, meeting places, etc.)
  - Structural patterns or landscape geometry (lines, shapes, edges, corner, nodes, junctions, etc.)

  Paths: infrastructures, road network, urban layout, etc.

SOCIO-ECONOMIC AND CULTURAL COMPONENTS

Social attributes

- ***Demographic structure*** (size, age, gender, density of population, educational level, occupation, etc.)
- ***Social organization***: social diversity, social groups, social interactions (experiential qualities: space-human, human-human, etc.), social capital, social activity (social public life), social networks engagement, etc.
- ***Social values***: knowledge and know-how in specific fields (craftsmanship techniques, productive techniques, creative industries, etc.), traditional ludic and festive expressions and celebrations, etc.
- ***Social activity, uses, practices, behavioural patterns and lifestyle***: public social life, habits and customs (urban leisure habits, dietary and habits, cooking methods, rituals and religious practices, etc.), and popular social practices, etc.
- ***Historical context and local collective memories associated to events, persons, objects, places, etc.***

Urban economic activities and services

- ***Economic activities influencing the whole image and identity of the city, and each district*** (residential, commercial, leisure and recreation, financial and administrative, port and trade activities, retailing and service activities, hospitality activities, light industry activities, IT sector activities, health and care activities, etc.)
- ***Urban functionality*** (transportation means and activities, urban mobility services, etc.)

Urban cultural components

- ***Regular offer of artistic and performing manifestations and cultural expressions***
- ***Agenda of cultural amenities, leisure and entertainment***

Citizens' social personality traits and sense of place

- ***Social qualities of the local population***
- ***Sense of place and place attachment***

Figure 1. Key components included in the urban identity analysis.

About the citizens' social personality traits, the final questions were devoted to know the residents' self-perception about their personality traits related to social qualities. This is still a preliminary brief analysis, but is relevant to include it in this kind of studies because it helps to assess the 'social acceptance' that is an important aptitude of the host population when considering the social sustainability of tourism destinations. Other questions along the questionnaire focused on the residents' sense of place aspects that is a topic addressed by many authors in urban sociological works (Altman and Low, 1992; Seamon, 1993; Shuhana, 2011; among others).

This concept has an identity value and refers to the functional and emotional links and associations (emotions, feelings, sensibilities, evocations, memories, legacy, etc.) that exist between inhabitants and their physical and social setting, resulting in the attribution of attached meanings as Relph (1976) and

Hayden (1997) stated. Thus, the space takes the consideration of a 'place'.
Results of the survey show that the interaction between residents and place presents high cultural, historical, artistic, scientific, and spiritual associations. It means that, according to the different scales of sense of place established by Shamai (1991), the residents' of València can be classified in the "Attachment to a place" category (people have a strong emotional relationship with the place), even in the "Involvement in a place" category (people have an active role in the place). In this sense, many elder respondents (20% of the surveyed were more than 56 years old) had their ancestors already living in the city, almost half of them, and they themselves have experienced the city for a long time (near 95% of them have been living in for more than 30 years). Tuan (1977) stated that rootness or ancestry are powerful elements that link people to a place. A half of the respondents have been actively involved in local and district festivities and celebrations, have relatives (more than 80%) and friends in the city, or they spend their leisure time in València (near a half of them). Place satisfaction is another criterion to evaluate sense of place; in this regard, when residents are asked about what they miss when they are not in the city, they reply referring to their lifestyle, relatives and friends, and food; but all of them strongly related with city's climate and the possibility to enjoy activities outdoors almost all year long.

5. Discussion and conclusions

From the point of view of an urban imageability analysis (how easily a person can form an associated mental image of the city), the preliminary results of the surveys induce to think that the main path of the city is the Túria River Green Corridor. This is an outstanding natural element, and, at the same time, a public space and a landmark. On the other hand, the historical city centre is still the core centre district of the city for all of them and many residents move from their districts to the historical city centre to spend their leisure time. These results are in line with those presented by Morales (2015). The idea is supported by the concentration of the main landmarks in this area providing historical contextualisation to this district, and it is also because is the meeting point for the thriving cultural life. Furthermore, respondents do not know well the name of the districts where they live, nor do they know how to distinguish the boundaries that separate from each other (edges).
Regarding landmarks, it is important to note that historical buildings and monuments configure the residents' mental image of the city, but they recognise likewise that the new architectural constructions such as the City of Arts and Sciences have taken advantage in the construction of the new urban image as stated previously Boira (2005).
The fact that the inhabitants of the city have a strong sense of place has favoured the development of a social authenticity; València is still a living city, not a musealized urban setting. The personality traits with which the Valencians perceive themselves, point towards sociability and hospitality. All these elements result a great attractiveness for foreign visitors.
As final reflections, it could be added that citizens recognize and value their best physical attributes and celebrate the role that they play in making their city a great place to live and work in. They also value the contribution that these attributes make to their identity and lifestyle. València's residents like human interactions and they are predisposed to share their city with visitors. Nevertheless, the survey has revealed that a large part of the respondents think that there is already a lot of tourism in the city, and this should serve as an alert to guarantee future urban social sustainability and tourism planning initiatives.

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CHAPTER #4.06

DEMOGRAPHIC AND SOCIOECONOMIC DYNAMICS IN THE CITY OF VALENCIA. AN ANALYSIS BY NEIGHBOURHOODS

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1. Introduction

The aim of this research is to analyze the changes that took place in the neighbourhoods comprising the city of Valencia after the period of economic growth and the real estate bubble that ended in the year 2008. After the bubble cracked in August 2007, a period of financial crisis and credit restriction started, which later turned into a generalized economic crisis. In 2009, Spanish economy entered officially into a recession with a real-GDP decrease of 3,6%, a significant job destruction that developed over the following years and a reduction of the household income. The period of economic crisis was deemed concluded by the year 2015. However, house building has taken longer to recover due to the huge surplus accumulated over the previous years. We consider both the recession period and the adjustment in the housing sector to have finalized in the year 2016. In this article we compare the state of neighbourhoods in the city before the crack of the housing bubble and after the adjustment's ending. We focus on three aspects: demography, the population's socio-economic level and the neighbourhood's economic dynamics.

2. Methodology

The analysis is based on 16 variables studied in 70 neighbourhoods of the city of Valencia, see Table 1. The data regarding demographic indexes, immigration and educational attainment have been extracted from the Municipal Census; data from the labour market such as occupation sector and employment rate were obtained from the Population Census; the information about economic activity by neighbourhood was extracted from the Economic Activities Tax; the data regarding vehicles per neighbourhood inhabitant were taken from the Mechanical Vehicle Circulation Tax, and lastly, the average housing price per sqm have been obtained from the data available on the real estate website Idealista related to housing prices. The other data has been accessed via queries to the Statistics Office of Valencia's City Council. The data of Population Census represent the years 2001 and 2011; housing price to years 2008 and 2017 and the rest data, to years 2006 and 2016. Based on said variables, with the most recent data, we've conducted a factor analysis with the purpose of selecting those variables which might be more representative or useful for our case study. The extraction method that was chosen is the "main components" method, out of which 7 factors came out (see Table 1). Factor 1 comprises socio-economic characteristics of the neighbourhood; Factor 2 relates to job quality and stability, also to other socio-economic features of the population; Factor 3 encompasses demography-type variables regarding population's age; Factor 4 shows the population's demographic growth, which may be linked to the neighbourhood's appeal to families; Factors 5, 6 and 7 each have a single variable, the highlight being the last one, related to the neighbourhood's economic activity. Based on the data from the factor analysis and the fact that the Population Census' data are better adjusted to the periods we want to compare, we've decided to select the following 6 variables. To estimate the variation in socio-economic status, we've chosen the variables percentage of vehicles with power greater than 16hp over the total vehicle amount in the neighbourhood and housing price. For demographic dynamics measurement, we selected active population index and aging index, and for the neighbourhood's economic dynamics we picked the percentage of economic activities over total population.

Finally, we've concluded that the percentage of immigration over the total population may be linked with the neighbourhood to attract population. The transformations which have taken place in the city were analyzed based on the chosen variables.

3. Results

Table 2 shows, for each of the 6 variables studied, values corresponding to the initial and final years as well as variance and position changes on the neighbourhood ranking when comparing both time frames.

	Componente						
	1	2	3	4	5	6	7
Vehicles with more than 16hp/total	,930	-,025	-,038	,150	-,051	,102	,156
% population employed in technical/scientific/intellectual Jobs	,869	,373	-,024	,108	-,047	,102	,001
Housing price	,861	,130	-,058	,115	,107	,343	,116
% population employed in management	,838	,173	,031	,283	,296	,083	-,070
Business owners with hired workforce, % population over 16 years.	,830	-,131	,146	,199	-,095	,061	,289
% population over 16 years with secondary studies	,789	,425	,000	,168	,011	,335	,072
% population with indefinite/permanents contracts	,038	,905	,085	-,072	,036	-,163	-,145
Employment rate	,484	,652	,048	,168	,041	,295	,232
Active population's structure index	-,099	,081	,885	,018	,279	,138	,143
Demographic progression's ratio	-,137	-,080	-,777	,028	-,093	,297	,392
% Population's variation 2016	,357	,029	,218	,819	,206	-,088	-,064
Migratory balance 2016, % over total population	,198	,000	-,214	,818	-,189	,273	,127
Aging index	,044	,014	-,252	,028	-,929	,063	,091
% of full-time employees	,299	,493	,179	,105	,592	,413	,042
Entrepreneurs, % population over 16 years	,444	-,059	-,073	,123	,001	,844	,001
Economic activities, % over total population	,569	-,060	-,110	,046	-,111	-,014	,755

Método de extracción: Análisis de componentes principales. Método de rotación: Norm

a. La rotación ha convergido en 10 iteraciones.

Table 1. Factor analysis. Rotated factors matrix.

Neighbourhood	Vehicles with more than 16 hp, % over total vehicles				Average housing price				Active population 's structure index				Aging index				Migratory balance, % total population				Economic activities, % over total population			
	2006	2016	var	change in ranking	2008	2017	var %	change in ranking	2006	2016	var	change in ranking	2006	2016	var	change in ranking	2006	2016	var	change in ranking	2006	2016	var	change in ranking
1.1. la Seu	8,81%	7,87%	-0,95	-2	3426	2868	-16,28%	4	102,10	140,30	38,20	-2	171,30	150,70	-20,60	-22	2,37%	4,90%	2,54	22	24,45%	33,61%	9,16	0
1.2. la Xerea	16,75%	14,43%	-2,32	-1	4340	2986	-31,20%	-1	95,10	129,40	34,30	-9	187,30	186,20	-1,10	-3	3,54%	2,34%	-1,20	-8	36,39%	58,94%	22,55	1
1.3. el Carme	4,04%	5,38%	1,34	20	3318	2076	-37,45%	-1	75,70	128,00	52,30	30	215,00	170,20	-44,80	-18	1,93%	3,12%	1,19	30	10,98%	19,03%	8,05	2
1.4. el Pilar	8,51%	7,85%	-0,66	-2	3401	2117	-37,76%	-2	85,50	108,10	22,60	-22	196,90	150,40	-46,50	-31	4,73%	1,83%	-2,90	-22	11,86%	17,92%	6,06	-3
1.5. el Mercat	8,94%	9,42%	0,48	2	3992	2549	-36,15%	-3	86,20	108,20	22,00	-23	192,20	149,70	-42,50	-32	3,89%	3,00%	-0,89	1	39,62%	49,43%	9,81	-2
1.6. Sant Francesc	20,58%	18,77%	-1,80	0	4598	3070	-33,24%	-1	100,60	125,10	24,50	-32	219,90	208,60	-11,30	-3	2,28%	2,68%	0,40	14	74,34%	112,05%	37,70	0
2.1. Russafa	8,31%	8,02%	-0,29	1	2375	2213	-6,79%	30	89,30	137,60	48,30	20	173,80	153,20	-20,60	-18	2,91%	1,71%	-1,20	-18	13,23%	20,89%	7,66	1
2.2. el Pla del Remei	23,11%	21,47%	-1,64	0	5281	3816	-27,75%	0	111,70	134,00	22,30	-21	171,30	170,60	-0,70	-4	0,95%	2,37%	1,42	42	38,74%	63,55%	24,82	1
2.3. Gran Via	13,33%	13,57%	0,23	0	4017	2695	-32,90%	-3	110,90	139,80	28,90	-9	152,80	157,60	4,80	-4	0,87%	1,67%	0,79	27	19,72%	30,10%	10,38	1
3.1. el Botànic	7,99%	6,94%	-1,06	-1	2947	1876	-36,35%	1	91,70	133,00	41,30	7	182,30	151,70	-30,60	-24	2,08%	2,58%	0,50	19	13,76%	20,43%	6,68	-1
3.2. la Roqueta	11,58%	10,49%	-1,09	0	3035	2000	-34,09%	2	83,30	124,20	40,90	4	199,20	181,70	-17,50	-7	3,11%	2,72%	-0,39	1	27,98%	45,52%	17,55	0
3.3. la Petxina	7,73%	8,16%	0,44	4	2715	1589	-41,49%	0	99,50	138,80	39,30	-2	159,10	156,70	-2,40	-7	2,15%	1,07%	-1,08	-22	9,96%	15,20%	5,24	-3
3.4. Arrancapins	9,23%	8,62%	-0,61	-1	3068	1839	-40,05%	-2	101,80	136,30	34,50	-10	177,20	177,40	0,20	-2	1,30%	1,83%	0,53	21	11,46%	18,35%	6,89	0
4.1. Campanar	6,37%	6,27%	-0,10	1	2725	1583	-41,90%	-2	108,80	127,40	18,60	-32	117,40	190,20	72,80	29	0,80%	1,28%	0,48	11	10,50%	17,25%	6,75	-3
4.2. les Tendetes	5,19%	5,52%	0,33	4	2438	1286	-47,25%	-9	98,20	119,90	21,70	-36	157,70	219,00	61,30	20	2,18%	2,77%	0,59	20	5,34%	9,63%	4,29	1
4.3. el Calvari	3,15%	3,96%	0,81	4	2274	1070	-52,92%	-4	83,90	121,80	37,90	-3	251,70	220,60	-31,10	-1	4,00%	1,94%	-2,06	-15	5,16%	7,19%	2,03	-13
4.4. Sant Pau	6,90%	6,49%	-0,41	1	3326	2365	-28,91%	3	79,90	141,80	61,90	55	41,90	54,80	12,90	0	1,11%	1,74%	0,62	23	7,15%	14,04%	6,89	6
5.1. Marxalenes	3,72%	3,54%	-0,18	-10	2357	1062	-54,96%	-11	92,70	124,70	32,00	-16	169,10	215,10	46,00	14	2,42%	1,88%	-0,55	-1	4,57%	8,18%	3,61	2
5.2. Morvedre	4,44%	4,95%	0,52	5	2532	1457	-42,47%	-2	90,20	126,40	36,20	-6	169,20	189,20	20,00	7	2,42%	1,00%	-1,42	-33	6,19%	10,05%	3,86	-2
5.3. Trinitat	5,45%	5,81%	0,36	5	2755	1580	-42,64%	-5	87,90	114,00	26,10	-18	206,70	206,20	-0,50	-1	1,88%	2,18%	0,31	18	7,27%	11,77%	4,50	-1
5.4. Tormos	4,23%	4,98%	0,75	11	2121	1056	-50,23%	2	82,90	131,40	48,50	24	108,70	126,50	17,80	-7	1,99%	1,80%	-0,18	6	4,40%	8,00%	3,60	4
5.5. Sant Antoni	5,10%	4,64%	-0,46	-6	2304	1620	-29,69%	23	95,80	134,60	38,80	1	110,60	147,10	36,50	1	0,26%	0,96%	0,70	7	5,98%	9,71%	3,73	-2
6.1. Exposició	15,42%	14,97%	-0,46	1	4289	2917	-32,00%	-2	98,50	104,40	5,90	-54	120,10	170,60	50,50	16	-0,07%	1,51%	1,58	30	12,56%	22,75%	10,20	3
6.2. Mestalla	10,11%	10,42%	0,32	1	3185	2293	-27,98%	4	93,50	122,30	28,80	-25	105,50	138,20	32,70	2	1,77%	1,84%	0,07	16	10,23%	17,90%	7,67	0
6.3. Jaume Roig	13,50%	14,18%	0,68	0	3709	3690	-0,50%	7	96,40	114,60	18,20	-36	123,20	151,20	28,00	-1	0,16%	1,52%	1,36	30	9,18%	17,97%	8,79	7
6.4. Ciutat Universitària	12,28%	11,69%	-0,59	0	3495	2018	-42,27%	-7	90,90	109,20	18,30	-30	110,40	164,70	54,30	19	2,28%	2,79%	0,51	17	14,84%	23,40%	8,56	1
7.1. Nou Moles	7,61%	4,51%	-3,10	-26	2258	1229	-45,58%	4	93,10	132,80	39,70	2	164,40	187,00	22,60	9	2,25%	1,39%	-0,86	-13	5,38%	9,09%	3,72	-3
7.2. Soternes	3,78%	3,61%	-0,17	-12	2280	1047	-54,06%	-9	86,00	134,60	48,60	22	136,90	152,40	15,50	-5	2,61%	0,88%	-1,74	-45	4,48%	7,03%	2,54	-6
7.3. Tres Forques	2,89%	4,25%	1,36	14	1968	813	-58,66%	-2	82,30	130,20	47,90	23	217,80	176,20	-41,60	-12	2,54%	3,40%	0,86	16	2,95%	4,46%	1,51	-2
7.4. la Fontsanta	3,08%	4,61%	1,53	23	2077	748	-63,98%	-6	81,10	113,40	32,30	-2	113,20	111,10	-2,10	-18	4,25%	2,30%	-1,95	-14	2,94%	5,40%	2,46	2
7.5. la Llum	4,11%	4,54%	0,42	2	2434	1059	-56,51%	-19	97,90	142,80	44,90	14	79,20	134,40	55,20	10	0,43%	1,21%	0,78	13	4,08%	7,76%	3,68	4
8.1. Patraix	5,55%	5,15%	-0,41	-5	2244	1272	-43,31%	7	98,50	141,70	43,20	7	135,30	163,20	27,90	3	1,55%	1,49%	-0,06	5	6,58%	10,51%	3,93	-1
8.2. Sant Isidre	4,12%	3,96%	-0,16	-14	2271	1310	-42,32%	8	88,30	140,10	51,80	28	42,70	90,10	47,40	1	-0,87%	0,56%	1,43	4	3,88%	7,84%	3,96	8
8.3. Vara de Quart	4,25%	4,33%	0,09	-4	2204	1160	-47,38%	6	115,70	132,30	16,60	-27	104,10	192,40	88,30	42	-0,19%	1,35%	1,54	25	7,53%	11,72%	4,19	-4
8.4. Safranar	3,74%	3,50%	-0,24	-13	2372	1326	-44,10%	0	94,60	150,00	55,40	23	64,50	96,20	31,70	-2	-0,15%	0,48%	0,63	0	5,32%	9,48%	4,16	1
8.5. Favara	3,74%	4,80%	1,06	14	2528	992	-60,78%	-31	78,40	145,20	66,80	61	99,60	109,90	10,30	-7	2,93%	1,36%	-1,57	-31	5,92%	8,46%	2,55	-7
9.1. la Raiosa	4,91%	4,80%	-0,11	-1	2350	1198	-49,01%	-4	80,20	130,60	50,40	30	147,50	156,20	8,70	-5	2,56%	2,40%	-0,16	2	6,47%	10,73%	4,26	1
9.2. l'Hort de Senabre	3,51%	3,50%	-0,01	-7	2236	1072	-52,07%	1	98,30	136,50	38,20	-2	102,00	142,20	40,20	9	0,99%	1,00%	0,02	2	4,52%	8,13%	3,61	2
9.3. la Creu Coberta	1,46%	4,00%	2,55	12	2363	1190	-49,65%	-7	101,60	125,00	23,40	-34	95,20	153,20	58,00	23	1,26%	1,31%	0,04	2	4,78%	6,87%	2,09	-15
9.4. Sant Marcel·lí	3,57%	4,16%	0,59	3	2168	1014	-53,21%	-1	95,30	138,00	42,70	8	132,30	172,20	39,90	11	1,07%	0,80%	-0,27	-9	3,61%	6,18%	2,57	-1
9.5. Camí Real	4,34%	4,28%	-0,06	-11	2463	1134	-53,98%	-17	60,20	135,50	75,30	49	60,80	64,80	4,00	-2	1,80%	-0,16%	-1,96	-33	3,85%	7,02%	3,16	2
10.1. Mont-Olivet	5,46%	5,50%	0,05	1	2871	1381	-51,91%	-18	87,10	126,80	39,70	3	185,90	175,50	-10,40	-6	2,48%	1,82%	-0,66	-7	6,41%	9,67%	3,26	-5
10.2. en Corts	4,58%	4,46%	-0,12	-9	2499	1376	-44,95%	-7	84,50	128,40	43,90	12	137,60	148,00	10,40	-15	2,60%	1,37%	-1,23	-26	5,63%	9,00%	3,37	-5
10.3. Malilla	4,63%	4,62%	-0,01	-4	2395	1399	-41,60%	4	89,20	143,50	54,30	33	80,00	127,70	47,70	7	0,66%	0,80%	0,14	-3	4,60%	8,09%	3,50	-1
10.4. Fonteta de Sant L	3,45%	5,03%	1,58	26	2118	960	-54,67%	-2	87,40	130,00	42,60	9	109,10	139,40	30,30	-1	1,65%	2,45%	0,79	27	4,41%	7,48%	3,07	-2
10.5. na Rovella	3,23%	3,83%	0,60	0	2733	939	-65,64%	-40	82,10	125,90	43,80	14	121,50	158,50	37,00	9	1,00%	0,84%	-0,16	-6	1,90%	4,50%	2,60	1
10.6. la Punta	7,70%	6,92%	-0,78	0	3374	1745	-48,27%	-9	92,80	98,00	5,20	-41	172,70	109,60	-63,10	-47	0,42%	1,11%	0,69	13	20,07%	20,04%	-0,03	-6
10.7. Ciutat de les Arts	10,23%	8,93%	-1,31	-2	3728	2422	-35,04%	-2	92,30	142,60	50,30	24	30,00	50,30	20,30	0	1,15%	3,36%	2,21	47	12,12%	20,14%	8,03	1
11.1. el Grau	6,82%	5,64%	-1,18	-3	2665	1460	-45,20%	-4	81,50	132,70	51,20	31	93,10	99,90	6,80	-6	2,43%	0,97%	-1,45	-36	9,77%	12,66%	2,89	-4
11.2. el Cabanyal- el Ca	4,05%	4,63%	0,58	8	1907	1421	-25,50%	34	89,00	125,80	36,80	-4	167,80	138,20	-29,60	-29	1,77%	0,90%	-0,87	-20	7,29%	10,48%	3,19	-7
11.3. la Malva-rosa	3,22%	3,98%	0,76	4	1953	1307	-33,05%	21	89,50	137,10	47,60	18	114,70	152,20	37,50	6	1,18%	-0,02%	-1,20	-20	2,95%	6,04%	3,09	2
11.4. Beteró	3,91%	4,32%	0,41	0	2294	1354	-40,99%	8	105,50	128,80	23,30	-28	78,80	118,50	39,70	3	1,29%	0,65%	-0,65	-18	3,19%	6,49%	3,30	4
11.5. Natzaret	4,32%	4,33%	0,02	-6	1923	1000	-48,00%	7	80,00	119,40	39,40	6	126,60	120,90	-5,70	-25	6,39%	1,29%	-5,10	-46	3,51%	5,01%	1,50	-4
12.1. Aiora	4,50%	4,31%	-0,19	-12	2560	1428	-44,24%	-5	84,50	132,00	47,50	20	111,90	123,30	11,40	-13	2,02%	1,45%	-0,57	-6	4,67%	7,80%	3,13	-6
12.2. Albors	5,92%	5,36%	-0,57	-5	2222	1405	-36,76%	20	97,10	122,80	25,70	-30	137,20	165,80	28,60	3	1,43%	1,76%	0,32	16	8,11%	12,18%	4,07	-2
12.3. la Creu del Grau	3,59%	4,06%	0,47	1	2491	1431	-42,55%	2	80,60	141,40	60,80	50	97,10	119,20	22,10	-3	2,55%	1,05%	-1,50	-35	4,13%	7,15%	3,02	0
12.4. Camí Fondo	5,05%	5,87%	0,82	11	2577	1473	-42,82%	-2	83,80	123,20	39,40	2	107,90	140,20	32,30	3	1,89%	3,00%	1,11	29	5,12%	10,38%	5,26	9
12.5. Penya-roja	12,93%	12,70%	-0,23	0	3844	2935	-23,65%	2	79,10	158,20	79,10	62	23,50	43,20	19,70	1	3,12%	2,70%	-0,41	-1	8,51%	17,27%	8,77	5
13.1. l'Illa Perduda	3,15%	3,50%	0,35	-3	2501	1350	-46,03%	-10	98,20	138,90	40,70	5	123,80	173,40	49,60	16	-0,35%	1,33%	1,68	24	4,82%	7,86%	3,04	-6
13.2. Ciutat Jardí	5,14%	4,90%	-0,24	-4	2824	1734	-38,61%	0	102,90	110,20	7,30	-55	116,00	242,00	126,00	38	1,35%	1,56%	0,22	11	7,25%	11,96%	4,71	1
13.3. l'Amistat	5,09%	4,57%	-0,53	-9	2340	1263	-46,00%	-1	81,70	112,60	30,90	-5	160,40	193,70	33,30	14	3,64%	1,95%	-1,69	-12	5,92%	10,25%	4,32	1
13.4. la Bega Baixa	6,86%	6,43%	-0,43	1	3145	1657	-47,32%	-6	98,80	115,30	16,50	-43	108,50	175,40	66,90	30	1,14%	1,41%	0,27	12	9,28%	14,62%	5,34	-1
13.5. la Carrasca	7,72%	6,93%	-0,79	0	2495	1884	-24,49%	16	108,90	109,00	0,10	-60	61,20	141,90	80,70	19	1,06%	1,91%	0,85	33	9,85%	15,66%	5,81	-1
14.1. Benimaclet	5,46%	5,32%	-0,14	-3	2426	1623	-33,12%	16	91,30	108,60	17,30	-33	126,00	170,10	44,10	9	2,27%	1,67%	-0,61	-6	6,83%	12,27%	5,44	5
14.2. Camí de Vera	4,32%	3,78%	-0,54	-20	2219	1513	-31,80%	28	112,10	127,30	15,20	-37	55,10	150,00	94,90	26	0,47%	0,76%	0,29	-3	4,02%	9,30%	5,29	17
15.1. Orriols	2,80%	3,26%	0,47	0	1942	850	-56,21%	1	71,50	113,70	42,20	9	125,10	134,50	9,40	-16	4,15%	1,62%	-2,52	-29	3,51%	5,54%	2,02	-3
15.2. Torrefiel	3,41%	4,56%	1,16	16	2039	928	-54,48%	-2	83,10	124,50	41,40	6	103,60	125,20	21,60	-3	1,56%	1,02%	-0,53	-12	4,25%	6,99%	2,74	-4
15.3. Sant Llorenç	5,74%	6,41%	0,67	4	3148	2113	-32,89%	2	73,00	166,10	93,10	67	29,30	40,50	11,20	-1	1,46%	0,07%	-1,39	-25	4,35%	11,15%	6,80	24
16.1. Benicalap	3,67%	4,05%	0,38	-1	2431	1394	-42,64%	1	84,70	122,90	38,20	-3	93,70	104,90	11,20	-6	2,13%	1,34%	-0,79	-14	4,51%	8,30%	3,79	5
16.2. Ciutat Fallera	3,00%	2,82%	-0,18	-3	2033	706	-65,26%	-5	76,70	119,50	42,80	11	80,30	128,30	48,00	7	2,70%	0,87%	-1,82	-47	3,29%	6,05%	2,76	1
Average	6,51%	6,48%			2742	1639			90,76	128,42			128,06	148,14			1,88%	1,65%			9,83%	15,68%		
Standar Deviation	0,0415	0,0369			704	684			10,53	12,56			49,79	41,03			0,01	0,01			0,11	0,16		
coefficient of variation	0,6382	0,5704			0,2569	0,4171			0,1160	0,0978			0,3888	0,2770			0,6725	0,5294			1,1263	1,0456		

Table 2. Variables and their variance per neighbourhood. Source: Valencia's City Council and real estate website Idealista for housing price. Prepared by the authors.

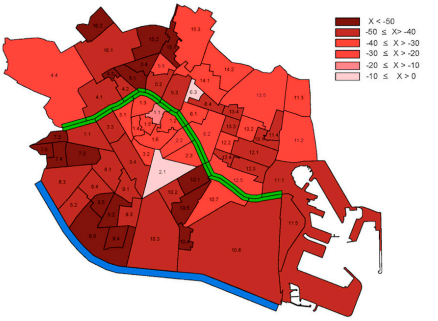

Figure 1. Variation in average housing price per sqm by neighbourhood, in percentage Source: real estate website Idealista, prepared by the authors.

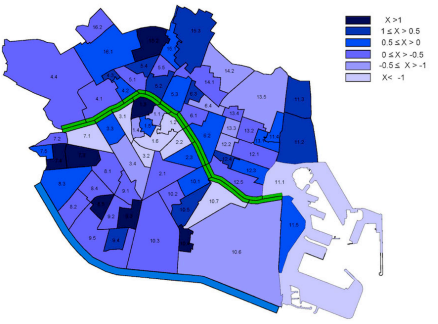

Figure 2. Variation in percentage of vehicles with power greater than 16 hp over total vehicles by neighbourhood. Source: Valencia's City Council, prepared by the authors.

As shown on Table 2, the housing price level has decreased significantly if we compare the two years considered for this study. In the year 2008 prices started to sink, an adjustment period that stretched on until 2014. During this year housing prices in the city sank around 40%, Llorca et al. (2016). According to the variation rates per neighbourhood, prices sank more in those which started at lower price levels. Comparing the years 2008 and 2017, the standard deviation has shrunk; however, the coefficient of variation shows noticeable increase and, based on this observation, it can be stated that the level of inequality in prices between neighbourhoods has increased. From a spatial perspective, housing prices have decreased more in the southern area than in the central and north-eastern zones of the city. Based on the price ranking (see Table 2 and Figure 1), the central neighbourhoods have barely changed their standing whereas those located in the north-east, near the universities, have peaked the most.

Regarding the indicator % of vehicles with fiscal power over 16hp over vehicles total, its average value in the city has increased. Based on variability, standard deviation has decreased as well as the coefficient of variation, whose change was even greater. We can affirm that inequality decreases according to this variable (see Figure 2).

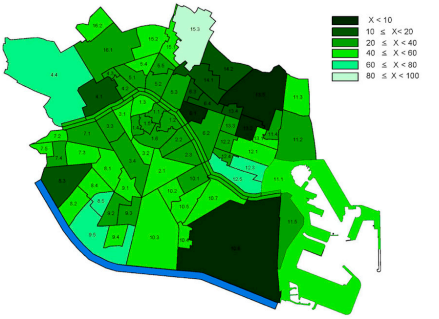

Figure 3. Variation in Active Population's Structure Index by neighbourhood. Source: Valencia's City Council, prepared by the authors.

The neighbourhood's active population's structure index shows the relationship between two age segments, 40 to 64 and 15 to 39 years old. The average value increases significantly, which implies an increase in the age of the population aged 15 to 64. Deviation grows lightly, but the coefficient of variation diminishes significantly when we calculate its value, thus differences shrink. This behaviour may be related to the reduction of migratory activity since the beginning of the 21st century. If we focus on the extreme values for this variable, it increases the most in neighbourhoods with the lowest starting values and the least in those with the highest values. From a geographical perspective, out of the top 10 positions with the lowest increase, 8 are located on the river's right

margin, which are mainly those closer to the university area (see Figure 3).

Regarding the neighbourhood's aging index (see Table 2), the average value increases while the standard deviation and the coefficient of variation decrease. Thus we can state that the aging index's behaviour is less unequal between neighbourhoods. In geographical terms, the aging index decreases in most of the neighbourhoods in central districts 1, 2 and 3; in all these cases the rank position sinks, which indicates that, relatively speaking, the population in central areas shows less relative aging in 2016 than in 2006.

Regarding the migratory activity (see Table 2), the average value and the differences between neighbourhoods decrease, the coefficient of variation diminish. Focusing on the starting values, neighbourhoods with the highest immigration rates in the initial year are the ones with major reductions. Moreover, this rate decreases in the majority of neighbourhoods which start with the highest immigration rates. On the contrary, it increases in the neighbourhoods that start with the lowest immigration rates. Neighbourhoods with intermediate values show both increases and reductions. Therefore, the data indicates that migratory movements are more balanced in 2016 than in 2006. Regarding the rank position changes, we observe that neighbourhoods with income levels above average such as Pla del Remei, Exposició, Jaime Roig and Ciutat de les Arts i les Ciències have climbed. We observe an opposite behaviour in low income neighbourhoods like Ciutat Fallera, Orriols, La Creu del Grau or Natzaret.

Finally, if we analyze the data related to the rate of economic activities over the neighbourhood's population, the average value and the standart deviation increase, whereas the coefficient of variation decreases. From a geographical perspective, the biggest increments in the activity rate take place in central areas. In districts 1 to 5, the rate increases in all neighbourhoods, even more in those with already high values. The smaller values are more abundant in southern and eastern neighbourhoods (see Figure 4).

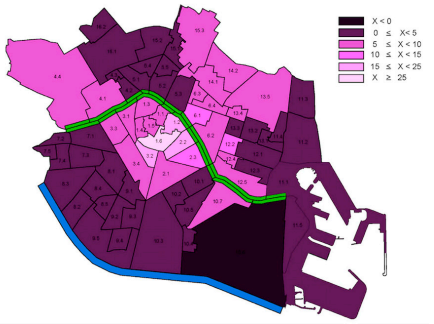

Figure 4. Variation in percentage of economic activities over total population by neighbourhood. Source: prepared by the authors.

We detect that there is no clear pattern between the 6 analyzed variables. Focusing on economic aspects and analyzing housing prices, we can affirm that inequality increases all over the city. Regarding economic activities, its influence is boosted in central areas. On the other hand, for variables related to demographics, such as active population's structure or aging index, inequality between neighbourhoods decreases. Finally, population attraction to neighbourhoods changes just as much as the immigration patterns of the years compared in this study.

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CHAPTER #4.07

INFLUENCE OF EXTERNAL FEATURES ON HOUSING PRICE. A STUDY IN THE CITY OF VALENCIA

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1. Introduction

Housing price has been a recurring matter for the second half of the 20th century. The first models which study the impact on the value of buildings are based on Von Thunen's model (1826) and analyse the influence of accessibility in housing value. Among all of them, the works of Alonso (1964), Mills (1972), Much (1969) and Wingo (1972) stand out. Every previous model departs from the idea that dwellings with worse accessibility bear the largest transport costs; because of that, a low price must be offered to compensate for the bigger costs derived from their worse accessibility. With the birth of hedonistic methodology, specially from the publication of Rosen's work (1974), other variables such as neighbourhood facilities (schools, leisure centers, care and sports centers, among others), natural environment and amenities are incorporated to housing value study; aspects such as effects of the neighbourhood's socio-economic level are added as well.

The current study is made with information collected from the city of Valencia during 2017 and 2018. This data have been obtained from two sources: on one hand, from the real state website idealista.com, through a data mining process using an application programming interface; and on other hand, from statistics sources of Valencia City Hall, through information of the register of inhabitants from Januray 1st 2017. The research claims to establish the influences of external characteristics such as accessibility, social and economic environment, presence of public facilities and amenities. To conduct the Factorial Analysis, the SPSS computing program is used. The purpose of this work is to identify, among a wide number of variables, those that are able to explain housing price and will be incorporated in a future price model based on Artificial Neural Networks. Thus, the number of factors obtained in Factorial Analysis will delimit the number of explanatory variables to apply in the neural network model.

2. Literature Review

The value of a dwelling relies on many aspects associated to both its internal characteristics and the characteristics related to its location. A short literature review is made, noting works than have analysed the impact of different aspects related to location over housing price.

Accessibility and transport. Completed studies about the influence of accessibility on the housing market have followed, according to Hwang (2009), different strategic lines. The first of them analyses how the improvements on accessibility, derivatives from transport investment, over the years, are capitalised on housing price. Another line has been focused on establishing the relative importance of accessibility in decision-making over residential locations. Several authors have found that accessibility has less meaning upon choosing residential locations than other factors such as housing and neighbourhood characteristics, Molins et al. (2003).

Additionally, several studies demonstrate that the impact of accessibility to work over housing price is not continuous throughout the urban space, Adair et al (2000). Regarding the proximity effect of subway or tram stations on housing price, it is considered positive, even though there is no consensus. While some find a significant positive impact on the properties' value, others are not able to discover the aforementioned positive relationship between both.

Green spaces. Urban green spaces have an important value as amenity because they represent supply of leisure opportunities, as well as an enjoyment related to aesthetics, Kong et al. (2007). As Miller (1997) notes, consciousness development about natural environments has, as a result, a strong demand for green spaces, and residents will pursue various proposals such as leisure, access to free space or to tranquility, among other. Bengochea (2003), analyses the relation between housing price and urban green spaces outfittings using hedonistic models and concludes by confirming the existance of an inverse relationship between housing sale prices and distance to urban green spaces.

Neighbourhood facilities. So et al. (1997) proof that presence of shopping centres and sports equipments are important factors in price determination. Regarding the impact of educational facilities' quality over housing price, the results of completed research are not unanimous. For example, Rubin and Goodman (1982) do not find any measurement of the added value of education that changes housing price significantly, while Goodman and Thibodeau (1998) obtain that results achieved by students affect housing prices in a positive and significant way. Different works validate that educational facilities have an important influence on housing price. Zahirovic et al. (2009), Gibbons & Machin (2003) and Fack & Grenet (2010) stand out.

3. Methodology

Factorial Analysis is a multivariable statistic technique whose objective is to reduce the n-variables group size obtaining a smaller new group of variables which is able to explain the common variability found in a group of individuals in which the original n variables have been observed. The factorial analysis method has been used in works related to the real estate market as well, because it allows to obtain a group of underlying factors which represent every housing price variable. Works of Fitch & Garcia-Almiral (2008), Altuzarra & Esteban (2012), Garcia-Almirall, Fullaondo & Frizzera (2008) and Vaz (2012) are of special relevance. In our factorial analysis, a sample of 16.719 properties from the city of Valencia has been used and, after refining, has been reduced to 13.003 dwellings. The 22 selected variables are only those that represent external characteristics of the houses and are the following:

-Average number of people per dwelling in neighbourhood.
-Average age of the neighbourhood's population.
-Average housing price per square meter in the neighbourhood.
-Percentage of population with a secondary school studies level or higher in the neighbourhood.
-Percentage of population aged 18 or older with a studies level lower than secondary school or similar in the neighbourhood.
-Percentage of number of private cars with a horsepower higher than 16 CV in the neighbourhood.
-Percentage of population with a secondary school studies level or higher in the neighbourhood. People who work in a management activity or as a professional technician, scientist or intellectual.
-Percentage of unemployed population over 16 in the neighbourhood.
-Square meters of green space per inhabitant, including Jardín del Turia.
-Distance to the centre of the nearest urban park, including Jardín del Turia.
-Traffic's average intensity in the neighbourhood (vehicles/month).
-Neighbourhood with façade in front of the Jardín del Turia.
-Distance to CBD.
-Distance to the nearest subway station.
-Number of museums in the district per 1000 inhabitans.
-Number of museums in the neighbourhood per 1000 inhabitans.
-Number of libraries in the district per 1000 inhabitans.
-Number of libraries in the neighbourhood per 1000 inhabitans.
-Total number of public education facilities in the neighbourhood per 1000 inhabitans.
-Total number of private education facilities in the neghbourhood per 1000 inhabitans.

-Number of hospitals in the district.
-Number of commercial activities, restaurants and lodgings in the neighbourhood per 1000 inhabitans.

For the extraction method, the analysis of main components with Varimax normalized rotation with Kaiser has been used.

4. Results

The rotation has converged in 10 iterations and after several proofs, 8 components or factors have been chosen for extracting, thus there are eight columns of factorial loads (see Table 2). The results of the factorial analysis are depicted in the following tables.

As observed on Table 1, the 8 factors explain 89,597% of the total variance.

Component	Addition of the squared saturations of the rotation		
	Total	% variance	% accumulated
1	6,133	27,879	27,879
2	4,141	18,823	46,702
3	2,400	10,909	57,611
4	1,914	8,699	66,310
5	1,649	7,497	73,808
6	1,276	5,798	79,605
7	1,100	5,000	84,606
8	1,098	4,991	89,597

extraction method main components analysis

Table 1. Total variance explained.

	Componente							
	1	2	3	4	5	6	7	8
% pop. > 18 years old with a studies level lower than secondary school or similar	,954	,131	,142	-,010	,007	-,004	,047	,076
% management activities, professional technicals, scientists or intellectuals	,921	,200	,115	,046	,082	,084	,121	,128
% population with studies > secondary school level	,902	,155	,180	,091	,118	-,054	,109	,190
Average housing price by square meter in the neighbourhood	,895	,252	,175	,171	,002	,098	,055	,050
% private cars with a horsepower >16 / nº private cars	,873	,317	,074	,018	,116	,243	,051	-,079
% unemployed population > 16 years old	,765	,333	-,076	-,051	,037	-,182	,053	,244
Total number of private education units in the neghbourhood/1000 inhabitants	,545	-,006	,231	-,023	,536	,059	,167	,428
Nº libraries in the neighbourhood/1.000 inhabitants	,189	,914	-,012	-,132	,078	,066	,004	,071
Distance to CBD in km	,424	,792	-,222	-,012	,147	,233	,003	-,087
Nº museums in the district/1.000 inhabitants	,253	,749	,074	,552	,079	-,022	,109	,007
Nº libraries in the district/1.000 inhabitants	,306	,727	,045	,522	,144	-,035	,172	,016
Nº museums in the neighbourhood/1.000 inhabitants	,187	,687	,194	,357	,085	-,299	,189	,134
Nº commerce activities, restaurants and lodging/1.000 inhabitants	,568	,685	-,133	,218	,139	,141	,092	-,069
Square meters of green space per inhabitant	,195	,097	,890	,053	-,009	-,134	,102	-,043
Neighbourhood with façade in front of Jardín del Turria	,316	-,135	,831	-,090	,191	-,123	,033	-,126
Distance to the centre of urban park (even Jardín del Turia) in m2	-,050	-,031	,795	-,030	-,048	,220	-,132	,254
Traffic intensity (vehicle/month)	,012	,123	-,079	,942	-,008	-,030	-,032	,017
Average age of the population	,089	,168	,012	-,037	,885	,185	,023	-,165
Average people per familiar sheet	-,028	-,434	-,062	-,440	-,622	,173	-,206	-,187
Distance to the nearest subway station in km	,113	,058	-,026	-,055	,124	,895	,112	,125
Nº hospitals in the district	-,207	-,166	,003	-,027	-,111	-,119	-,920	-,113
Total number of public education units in the district/1000 inhabitans	-,424	-,049	-,038	-,063	,097	-,167	-,133	-,761

Table 2. Matrix of rotated components.

The following cluster of variables in latent factors is given by the factorial analysis results, see Table 2:

•Factor 1: % of population in the neighbourhood with a studies level lower than secondary school or similar (0,954); % of population in the neighbourhood who work in a management activity or as a professional technician, scientist or intellectual (0,921); % of population in the neighbourhood with a secondary school level or higher (0,902); average price of residential square meter in the neighbourhood (0,895); % of number of private cars in the neighbourhood with a horsepower higher than 16 CV (0,873); % of unemployed population in the neighbourhood over 16 (0,785) and number of private education facilities in the district (0,545). This dimension lets us know about the neighbourhood's socio-economic level, allowing us to distinguish one neighbourhood from another.

•Factor 2: number of libraries in the neighbourhood (0,914); distance to CBD (0,792); number of museums in the district (0,749); number of libraries in the district (0,727); number of museums in the neighbourhood (0,687) and number of commerce activities, restaurants and lodgings in the neighbourhood (0,685). The factor shows the accessibility, understood as a triple axis: general accessibility to CBD, to cultural equipments and to amenities.

•Factor 3: square meters of green space per inhabitant (0,890); neighbourhood with façade in front of Jardín del Turia (0'831) and distance to the centre of the nearest urban park, including Jardin del Turia (0,795). This factor is related to the natural characteristics of the environment.

•Factor 4: traffic intensity in the neighbourhood (0,942).

•Factor 5: average age of the neighbourhood's population (0,885) and average people per dwelling (-0,622). This factor refers to demographic characteristics of the population.

•Factor 6: distance to the nearest subway station (0,895). It is a general accessibility variable.

•Factor 7: number of hospitals in the district (-0,920).

•Factor 8: number of public educational facilities in the district (-0,761).

Once the latent factors which summarize every information about the location are identified, a model can be built, selecting a variable as an agent for each factor. The more usual process consists in selecting, for each factor, the variable with the biggest factorial load in absolute value. To evaluate the prediction capacity of the selected variables, a regression analysis of the variables according to the price logarithm is made. After several attempts, the variables selected as predictors have been the following:

-Factor 1. Average housing price per square meter in the neighbourhood.
-Factor 2. Number of commerce activities, restaurants and lodgings / 1.000 inhabitants.
-Factor 3. Distance to the centre of urban park (including Jardín del Turia) in meters.
-Factor 4. Traffic intensity (vehicles/month).
-Factor 5. Average people per familiar sheet, according to register of inhabitants from January 1st 2017.
-Factor 6. Distance to the nearest subway station (km).
-Factor 7. Number of hospitals in the district
-Factor 8. Total educational public facilities /1.000 inhabitants in the district.
Using regression analysis, we establish the contribution of each and all factors on the dependent variable (housing price in our case); see Tables 3 and 4.

Model	R	Squared R	Corrected squared R	Error type of estimate
	,721	,520	,520	,0414495

Table 3. Model summary. Dependent variable: price per square meter.

Modelo	Coeficientes no estandarizados		Coeficientes estandarizados	t	Sig.
	B	Error típ.	Beta		
1 (Constant)	,042	,008		5,523	,000
Average housing price by square meter in the neighbourhood	,214	,003	,698	70,480	,000
Nº commerce activities, restaurants and lodging/1.000 inhabitants	,007	,003	,028	2,697	,007
Distance to the center of urban park (even Jardín del Turia) in meters	,001	,002	,002	,355	,722
Traffic intensity (vehicle/month)	-,005	,003	-,012	-1,763	,078
Average people per familiar sheet	-,043	,008	-,042	-5,393	,000
Distance to the nearest subway station in km	-,010	,002	-,026	-3,981	,000
Nº hospitals in the district	-,005	,001	-,022	-3,215	,001
Total number of public education units in the district/1.000 inhabitants	,006	,002	,018	2,472	,013

Table 4. Coefficients. Dependent variable: price per square meter.

5. Conclusions

In light of the obtained results, we can explain the housing location characteristics with eight variables of the neighbourhood. It should be noted that external characteristics are capable of explaining 52% of the behaviour of housing prices among a fairly comprehensive test sample. Each one of them regarding to socio-economic level, accessibility to cultural equipments and to amenities, natural environment, traffic intensity, demographic characteristics of population, distance to subway stations, number of hospitals in the district and public education facilities in the district.

Out of the regression analysis conducted using the 8 selected variables, the most relevant ones are: neighbourhood's price per sqm, average number of family members per family registry, distance to subway station, number of economic activities and number of hospital facilities. According to the obtained results, we consider that variable choice for green space measurement should be re-evaluated; on the other hand, regarding hospital facilities per district, we might reconsider its inclusion in our future model.

Obviously, in order to create a housing price model and calibrate its setup, variables related to household internal characteristics, such as number of rooms/bathrooms or house condition, must be taken into consideration. This aspect will be developed in the upcoming stage of our research. The inclusion of internal and external variables will enable the creation of an artificial neural network model which will allow housing price estimation with a minimal margin of error.

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CHAPTER #4.08

A STRATEGY FOR RESILIENCE. ALAMAR, HAVANA

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1. Complex Projects (CP) Studio Havana

The CP Chair at the Department of Architecture of the TU Delft, the Netherlands, offers a master specialization in architectural design that typically addresses areas in transformation that are in need of grasping their possible futures (Kaan 2015). In doing this *"students and teachers are encouraged to look critically at their surroundings; to gather, organize and question the complex forces that ultimately manifest themselves into our built environment […] The architect must […] see the world through different lenses: as a planner, organizer, politician, economist, philosopher, strategist, humanitarian, and visionary"* (CP 2018).

In the academic year 2016-2017 the Complex Project design studio addressed the city of Havana, Cuba, in the wake of a changing political climate that is creating expectations of development and modernization. These perspectives of resurgence interact with a socio-spatial system that for different reasons remained as 'frozen' in the past, like a time-capsule from the '50s suffering from strong physical and ideological decadence. Here the unavoidable liberalizations will unlock a cherry-picking process in which exploitation-ready assets will be the priorities in the political and economic agendas. A territorial polarization of favoured versus backward areas is therefore lurking, creating inequalities that definitively undermine the revolution's *raison d'être* of socio-spatial equity. What contributions give architects and planners to these dynamics? What are the possible design assignments? The field for complex urban interventions that unfolds for the designer in contemporary Havana is inhabited by complex combinations of assets, contradictions and polar relationships for which multi-layered considerations are necessary.

2. Alamar

Differently from Vieja (the UNESCO world heritage city centre) or Vedado (the touristic pole of the '50s) which showcase ready-made opportunities, Alamar presents socio-spatial conditions constraining a quick valorization. Alamar has been realized during the '70s and hosts today 100.000 inhabitants, but was never fully completed as an urban entity. Here the impact of the Special Period[1] has been particularly hard. It accelerated social and spatial decay and it emphasized the burdens of the physical distance from Havana. Today Alamar enjoys little appeal among *Habaneros* in spite of the cheap prices and future possibilities[2]. It is a forgotten neighbourhood suffering from negative territorial polarization, even more when confronted with the expected growth in Havana's value areas.

The chronicles of the development of Alamar, the changing conditions behind its urbanization in time and its social, economic and spatial present have been described earlier and are by now notorious among scholars (e.g. Provoost 2017). Key-moments in Alamar's development give form to a narrative of ambitions and compromises, of ideology and opportunisms, resulting in the clash of opposite socio-spatial models.

[1]The *Periodo Especial* is a period of harsh economic depression that followed the 1989 dissolution of the communist block and COMECON depriving Cuba of its economic and commercial partners. It originated forced autarchy and necessary self-reliance.

[2]Due to privileged position along the seacoast between city centre and eastern beaches, and the availability of cheap space. Nevertheless Alamar is not yet ready to exploit its potential in the short term, as this would require extensive investments.

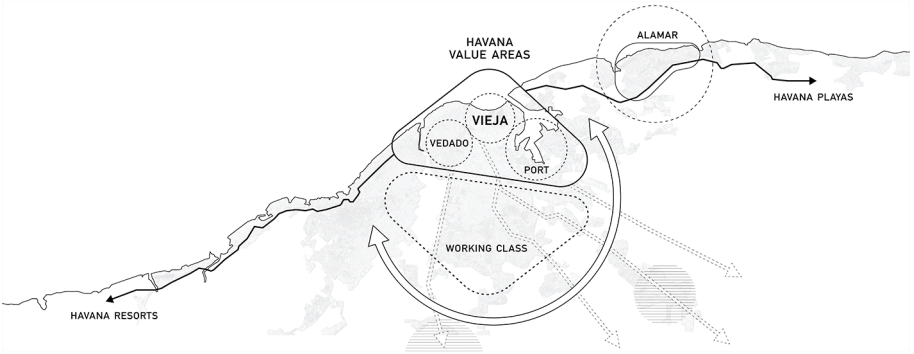

Figure 1. Alamar's position in Havana's region.

In 1955, Sert's *plan piloto* for a modern Havana proposed expansion to the east (Scarpaci et al. 2002). Among the planned settlements Alamar was to host a speculative suburb made of single-family dwellings along the coral seacoast, conceived for the affluent (American) client. A typical meandering street pattern was laid down, served by a new highway leading in few minutes to downtown[3] Havana at west or to the beaches at east (Pacheco del Monte 2015). After the revolution it was decided to stop developments in Havana aiming to a better territorial balancing across Cuba. In doing this, East-Havana areas were given different scopes. Alamar's single-family plots were turned into plots for multi-storey flat apartments, densifying the area but not the serving infrastructures.

Alamar is Havana's only new town and was to become the ideal living place for *el hombre nuevo*, the new man of the revolution. Prefabricated building technologies were imported from the Eastern European allies: Yugoslavia, Czechoslovakia, USSR (Kilmartin & Singh 1992). Because the building for the 'new man' had to be built by himself, *microbrigadas* were set up: groups formed by 33 workers with often no experience in construction (Mathey 1989) that realized Alamar as well as many other Cuban settlements[4]. Regardless of the final building quality, the *microbrigadas* have been very important in the becoming of socio-spatial Alamar for introducing the associationism's DNA in the neighbourhood.

3. Methodology, Hypotheses, Narrative

The methodology adopted by the CP studio to unfold design assignments for Alamar included a sequence of interconnected steps that make use of abductive forms of reasoning (Dew 2007; Hougaard 2015) informing conditional hypotheses. These construct the leading narrative, a framework that unravels contextual complexity to envision design assignments.

1.'Journalistic' inquire including a broad orientation on and separation (anatomy) of the context's layers in order to expose/reveal spatial, social, cultural, political, and economic conditions: mapping, physical models, interviews, site explorations, sources.

2.Establish conditional relationships through the layers: speculative hypotheses based on educated guesses. In this crucial phase findings are selected and organized with the aim to formulate plausible (= inference to the best explanation) hypotheses explicitly anchored into the inquired: questions, visualization of 'initial suspicions', collages.

3.Define a leading narrative that combines the

[3]Driving distance between Havana Vieja and Alamar is about 14 km.

[4]Before being employed in Alamar *microbrigadas* were already experimented in other locations. Also watch: Zeyfang et al. 2013. After building the members of a *microbrigada* could claim an apartment for their own living.

initial 'suspicions' into a strategy, not avoiding contradictions and personal fascinations: urban diagrams, (annotated) maps.

4.Proposal of architectural topics informed by 'state-of-the-art' typological explorations: concepts, program requirements, conditions for building and siting, massing studies.

5.Design of the individual proposals in the given plot, iterative prototyping cycles: the architectural and construction elaborates, models, details, visualizations, final reports.

Step 1 highlighted the transformation of physical distances into disconnections and pointed out that the disconnections are manifold and go deeper, also implying disconnections from opportunities of city development and from Havana's cultural, social and economic dynamics, jeopardizing the area's ability to meet chances. The students also discovered the presence of an unique set of autonomous microcultures constructed through the diverse background of the inhabitants and modelled by the isolation of disconnections: music, art, ingenuity[5] , production. The successful Alamar's urban farming Organoponico Vivero (Cifuentes et al. 2016) worked here as a powerful inspiration, like a *microbrigada* for urban agriculture originated by the necessary self-sufficiency of the Special Period. In step 2 (conditional hypotheses) the students extended this conceptual construction to the other mapped qualities envisioning associations to support e.g. Alamar's dynamic art and music scene, the inhabitants' ingenuity, the microeconomy of markets. Although considering the evident criticalities, the students reverted the common negative reading of disconnections by recognizing their positive role for generating microcultures and identities, now offering opportunities for value-building in the medium term. Elaborating on these found assets, the narrative (step 3) approached Alamar as an autonomous ecology of interconnected micro-cultures (an independent town). It proposes an architectural agenda of social, programmatic and spatial priorities to enforce

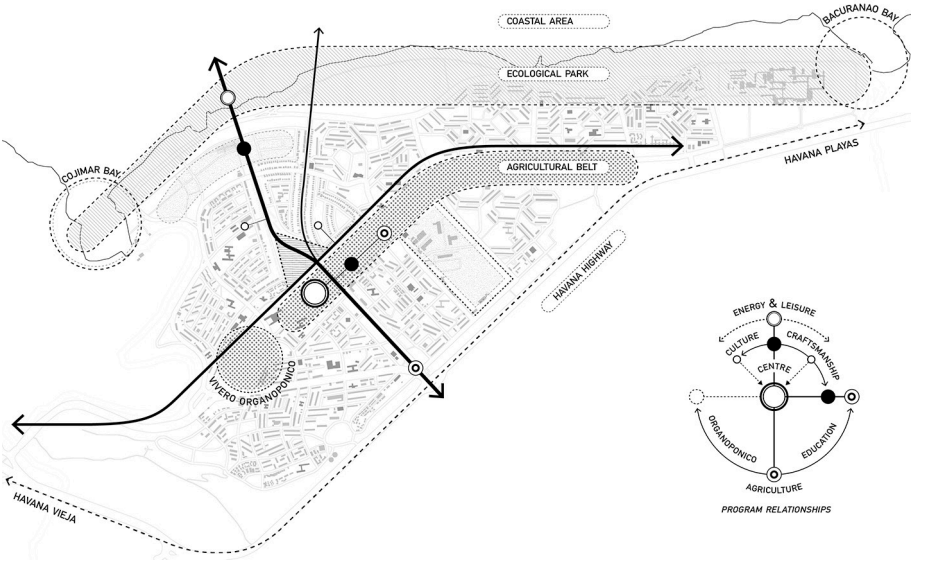

Figure 2. Diagrammatic representations of the strategy.

[5]Following on Special Period constraints, Cubans were invited to: 'build your own machinery'. Handbooks about recycle, reuse, repair, upcycle were distributed by the government. Ingenuity became an 'act of technological disobedience' (Oroza 2012).

a new geography of relationships for bridging the socialist-globalist divide and prepare to modernization and investments in the medium term.

4. A Strategy for Resilience

This position forms a conditional frame of reference for envisioning a progressive future for Alamar through a strategy that aims to generate resilient value and belief. In order to achieve this goal four programmatic priorities were defined: 1) tackle the infrastructural deficit; 2) provide opportunities for local assets; 3) educate young and elderly population to the opportunities; 4) build upon cultural values for local identity.
The related design interventions were positioned in order to: 1) induce hierarchy and centrality for a recognizable geography; 2) clarify public and private, urban form, orientation; 3) materializes local identity: 'fitting landmarks'; 4) inspire a process of requalification and retrofitting of the existing. The strategy realizes urban hierarchy by emphasizing the crossing of the two main axis of the neighbourhood: the EW agricultural belt (area reserved for productive and educational functions – including Organoponico) and the NS axis connecting the highway to the seacoast, providing a new gate to Alamar and a destination point at the coast. At the crossing a new multifunctional centre establishes relationships with adjacent cultural programs and reactivates the derelict amusement park. In the strategy the unbuilt waterside strip becomes an ecological park with a similar public role than Burnham's Chicago waterfront, with emphasis on sport and recreation.

4.1. Individual Designs

Accordingly, the locations for the individual design projects are key to the desired socio-spatial geography. They address the crossing axis or engage the spaces between the housing blocks aiming to establish guidelines. At the same time the architectural interventions connect the design sites with 'fitting' programs. The added value pursued by the strategy is the creation of a socio-economic ecology, a circular microsystem of interventions connected to the existing assets. The architectural designs initiate the strategy acting as catalysts for developments in key locations and for the definition of the public space.
In particular: the Whole-Sale Market (4) works as a hinge between Alamar and Havana's farmland creating economic opportunities, while the Agricultural School (1) addresses the main asset of the area (the urban farming) and is a help-desk for inhabitants. Both interventions refer to Organoponico as guiding asset. Similarly the Craftsmanship Centre (2) offers a shared workshop platform to local ingenuity, that finds a centre for self-employment in the central

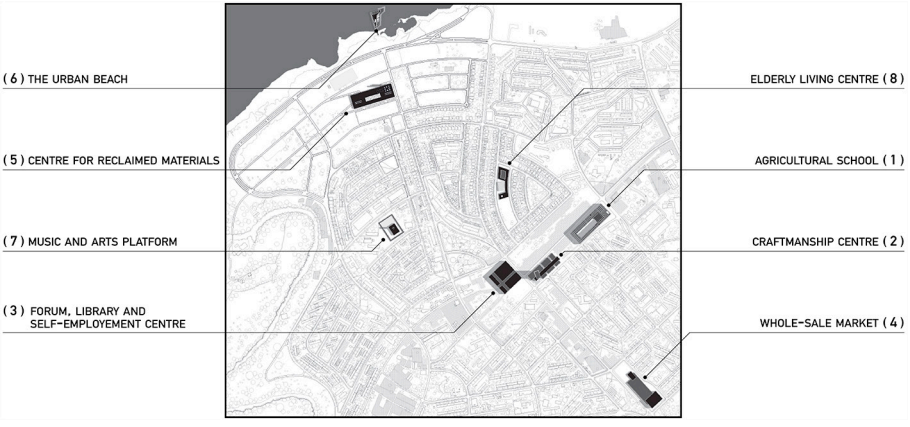

Figure 3. The 8 design interventions in Alamar.

Forum (3, retail, living), supported by a public library. The Forum marks the new centre of Alamar, it revitalizes the derelict amusement park and creates a cultural pole. The materials for the Craftsmanship Centre are supplied by the Centre for Reclaimed Materials (5, built itself from recycled materials) which addresses recycling and upcycling in Alamar. Here the instruments and tools are made or repaired which can be used at the Music and Art Platform (7). This last includes broadcasting facilities for Alamar radio and gives form to vacant spaces in-between housing blocks. Also the Elderly Living Centre (8) establishes direct relationships with its surrounding housing, being as well a centre for the neighbourhood. The Urban Beach (6) provides a way to access the ocean stimulating leisure economy, and gives the NS axis a destination point. The project also operates as a Storm Farm by employing the power of storms to produce energy in order to keep the vital centres of Alamar working after hurricanes.

CP aims to increase the synergy between academic positions and architectural design practice. Notwithstanding the extensive investigation and the close understanding of the local dynamics the position of the students necessarily remains an academic position. Stakeholders like investors, government (decisive in Cuba), and influential personalities manoeuvring consensus will very much affect the design field. How realistic is thus plausibility in academia? Is this project 'probable' or just 'possible'? The oscillation range in politics, society and economy is by definition unknown. In this project the students' narrative aims to produce consensus as means to strengthen a shared belief to resist critical changes. They do this by transforming criticalities in opportunities through the concrete example of evidences like Organoponico, plausibly an efficient way to engage many.

In CP design studio the close relationship between inquiry and narrative is the central mechanism for creativity. The shared narrative

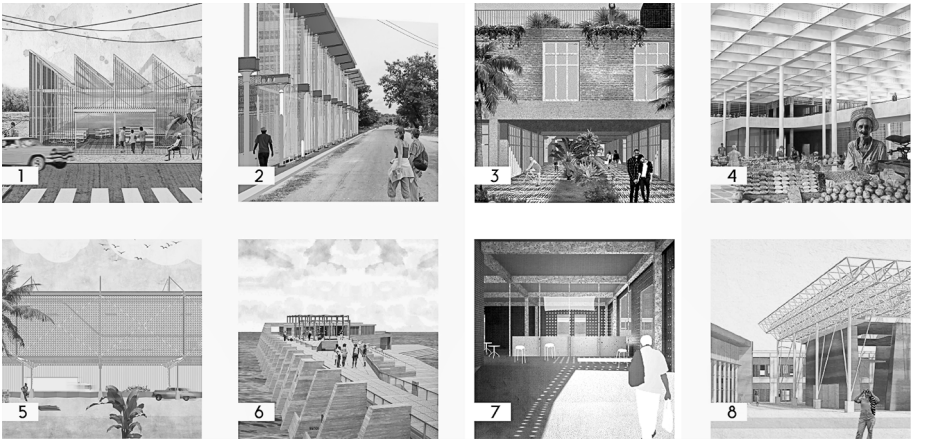

Figure 4. Pitch images from the 8 designs.

5. Considerations

The Alamar studio generated design proposals that are well-embedded in the inquired context. Few considerations upon academic logic and presumed 'objectivity' follow below.

is the conditional framework ('what if…?') that creates shared images and frames the development of design proposals. The design of complex assignments cannot be inferred by relationships of causality proper of 'traditional' science (deduction, induction)

but by relationships of conditionality proper of the investigation of possible futures (De Jong 1992). This includes an iterative process of reflection and (design) decisions in which the made choices and the modalities of thought are documented and made explicit – in this case documented through the combined of collages, inquiry and design books and physical models.

What did students learn from the case-study Alamar? The main discovery in this project was the connection of diffused 'ingenuity' with 'associationism' as plausibly resilient asset for place-bound socio-spatial development. It might be therefore expected students' designs to address minimalism and self-construction. This was not the case. Although modelled on low-budget hypotheses and on 'fitting' technics / materials, the proposed interventions are all designed with an architectural ambition for which an (institutional) investor would be needed. In this, the students conferred a pro-active role to architecture as value-bearer and content-materializer, a visual symbol of Alamar potentialities for the future.

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CHAPTER #4.09

THE PROJECT OF COHABITATION

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1. Introduction

The new millennium is marked by drastic changes in the social and environmental landscape, which are deeply affecting the way we live: the consequences of climate change caused by pollution and the excessive exploitation of soils are certainly urgent matters. So far we have come to recognize that we simply have to coexist with such problems and learn to live with their consequences in our daily lives. But while coexistence often refers to the sole action of passive coexistence without any productive interaction, active coexistence implies some form of exchange.
This is the reason to hope that in the future architecture, the city and the whole landscape should approach such emergencies by encouraging interaction and productive exchanges between different disciplines and cultures.
Cohabitation can therefore be achieved through tactics that offer the possibility to generate new creative spaces in transformation processes: actions taken by or for actual users, flexible actions that can be continually changed, reshaped and adapted to cope with unexpected interference. Cramer, (2017)
The current climate change is a fact and the global warming is the most obvious phenomenon, with the certain consequence of raising sea levels (but we are not sure of the planetary extension of the phenomenon), perhaps even of more than three meters in a century: it is no longer enough therefore to plan and build so as not to aggravate the phenomenon triggered and not immediately invertible, but also to cope equipped with the increasingly acute events that are unleashing and the probable long-term trauma that will be verified.
The impacts arising from only raising sea levels include, for example: increased damage caused by extreme weather conditions, surges and floods; destruction of ecosystems and property; migration and extinction of species; scarcity of resources, food and water; violent conflicts and human migration. Resilient edges, (2018)
The anthropic settlements along the low coasts, the areas of the river deltas and in the alluvial plains, are therefore highly at risk drowning, and you have to act in a tactical and resilient way if you do not want to succumb entirely to the events, with strategies proactive, adaptive and choral, and not already only defensive or sporadic.
The planning of effective and appropriate strategies to adapt to climate change is necessary both in historical stratified territories and in areas still in the urbanization phase, in the same way because it is the attention towards all forms of urbanization to be invested, in a rediscovery of the geographic dimension of the city. Nicolin, (2014)
In this vision imposed by future upcoming events, the architectural project approximates that of the infrastructure. Projects can be designed and built to meet the current needs of course, but also to provide a projective action that can assist in the event of extreme weather conditions and become support infrastructure for new settlement patterns at the end of the cycle, in a multivalent adaptive temporal vision. Climate, (2012)
Land saving policies for new construction projects, now widespread especially in Europe, force to exploit abandoned buildings and existing areas, already compromised or unused, setting out a sort of urban "maintenance" of the city's resources ("zero-volume" planning). Looking further ahead, even the environment around cities (the territory of influence on which it gravitates) needs strong maintenance, because of its excessive economic and anthropic exploitation or absolute neglect of many parts of it which are no more functional. In this second plan, beyond the emergency opportunities that unfortunately often impose, it is more difficult to think and implement current active policies of strategic safeguard interventions. It would therefore seem appropriate to seek an alliance between these two dynamics in progress, not to see them always opposed, indeed to be able to imagine the construction of new landscapes,

their conservation / maintenance through active prevention. Cities, (2012)
There are still too few examples of projects and even less of achievements that can be counted today, but a new sensibility is emerging on the part of the various actors that will have to become a short-term trend.

2. Proactive designs

2.1. Pisa: Campus of the Sant'Anna School

The Pisa's plain, for example, is strongly characterized by the reclamation system and therefore by the network of ditches that delimit the fields, creating a network that sometimes assumes a role of connection with the urban and building fabric. Some lands in the eastern quadrant are part of a large area for rolling works: a project that is about to be implemented has defined the hydraulic loads to be disposed of and the volumes to be invaded, providing a solution that allows the realization of the "Sant'Anna - San Giuliano Scientific Technology Park" in a way compatible with the needs of hydraulic defense of the territory. (Fig.1)
The land on which to operate is part of a large area intended for rolling works, a constraint placed as a result of a project of hydraulic reorganization of the North-East basins of the Municipalities of Pisa / San Giuliano thermal baths, coordinated by the "Land Reclamation Authority Rivers and Trenchs of Pisa's Provincia", as part of the Program Agreement for the transfer of the activities of the University Hospital of Pisa and the University Center from S. Chiara to Cisanello.
The Consortium project plans to lighten the drainage network headed by the Morto River, which is substantially overloaded and the only outlet to the sea, with the construction of a drainage system for the discharge of water into the Arno river.
The realisation of the Scientific Technology Park is foreseen inside the cavity 1, over an area of about 43,000 square meters, to store approx. 33,480 cubic meters of water, to which 3,500 cubic meters are added to compensate for the realisation of waterproof areas.
The car parks necessary for the new structure must be placed at a security level of a minimum of +2.00 meters above sea level, while the buildings (including greenhouses) at a height of at least +3.50 meters above sea level. (Fig.2)

Figure 1. Project for the Technological Campus of the Sant'Anna di Pisa School in an overflow case (ZaniratoStudio).

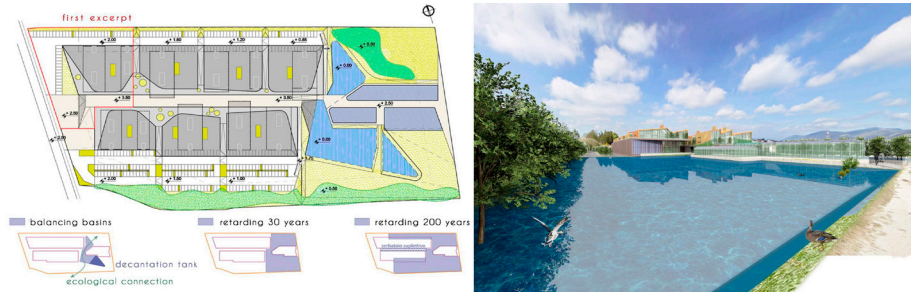

Figure 2. Masterplan project for the Technological Campus of the Sant'Anna di Pisa School (ZaniratoStudio).

These are the preconditions that have led the governing bodies of the 'Scuola Superiore Sant'Anna of Pisa' to initiate the procedures to develop the project "Science and Technology Park - Life and Environment Sciences". They are aimed at the creation of a new research infrastructure, at the forefront in the fields of environmental protection and enhancement, genomics systems, new energies, advanced biomedical and sustainable agriculture.
In this Park, scientific activities related to the various disciplinary sectors tied to the School will need to cohabit, with the aim of pursuing an effective and real synergistic integration. There will also need to be space for activities related to incubators for new businesses, spin-offs emerging from the initiative of young researchers or from the collaboration with private companies in the high-tech sectors. It would also be highly useful and beneficial to have enough space for residential social centres. Meeting spaces, areas for experimental greenhouses, climatic cells, growth chambers.
The main feature that highlights the area of intervention is its absolute condition of limit: on the fringe of the Pisa's conurbation that laps the countryside, "encroaching" in the territory of San Giuliano thermal baths, tangent to the fast road F. Giovannini - Moruzzi, within a larger, expansive area. The proposal of the Guide Project, drafted and approved in 2015, interprets all these extreme conditions explicitly.
To occupy a part of cultivated land (now an enclave) encourages us to acknowledge that the urban landscape must dialogue with the agricultural sector, that architecture needs to respect and blend harmoniously with the nature of the crops, the agricultural structures, the reclamation works, the network of the ditches and trenches.
The relative marginality of the area derives from its being land of reclamation, made "habitable" only in recent times, torn from the dominion of the great river, of its meanders: the hydrological risk that weighs on the area reminds us of all this and its edificatory possibility has to deal with a reality not so remote and still latent.
The altimetric differentiation, which will be expected to be made respecting the countryside plan to allow the establishment of the Research Center, raised inside the expansion tank represents a critical element in the relationship between indoor and outdoor spaces, as well as environmental characterisation. (Fig.3)

To avoid widespread deep excavation and to meet the construction requirements of the detention basin, it was considered appropriate to extend the reservoir also to part of the intended areas for parking (only for returns higher than 30 years), and placing the storage tanks below them (which remain at the marketing quote and security level of +2.50 meters above sea level). The two lateral side, intended for parking, mediate the height of the building construction plan and the concentration of the green area of the main cavity, which will therefore be less excavated.
With this "expansion" of the hydraulic constraint it was possible to think of one of its environmental enhancement plannings, taking into account altimetric variations of the soil, with differently articulated additions and excavations, to also better approach the "raised" settlement to a mandatory quota of 3,50 meters, to its immediate external appliances, with variable altitude between 2,50 meters and 0,50 meters

Figure 3. Views of project for the Technological Campus of the Sant'Anna di Pisa School (ZaniratoStudio).

above sea level. All the pipelines and reservoirs that store part of the water, will simply be placed under the unbuilt areas (car parks or central pedestrian routes).
A further technical possibility that has been taken into consideration is associated with the nature of the land that is inconsistent, being a newly drained floodplain: the foundations of new buildings will of course take this into consideration (to counteract the inevitable failure expected in the years following the completion of the works), resulting in an additional basement technical plan (to house the compensation jacks). This last technical room on which the building "floats" is proposed in turn as a series of artificial reservoirs, in the case of exceptional controlled flooding.
In this way it is possible to introduce the solution to the problem of preserving the hydraulic invariance induced by the construction of the area by activating these multiple possibilities. The stratigraphy of the excavation land highlights the possibility of deepening the earthworks and therefore it will be possible to make this presence coincide with that of a permanent pond (of environmental compensation, along the ecological corridor).
The lifting pumps can guarantee the stable water level of the reservoir and a necessary water change: the feeding of the artificial reservoir can be associated with the collection of rainwater and its irrigation reuse, for the conservation of green areas, the cultivation and operation of experimental greenhouses. If one considers then that the campaign plan on which to build is on average 2, 50m ASL the planned intervention strategy satisfies both the coexistence with the controlled floods in the rolling crate and any pitfalls arising from the raising of the Seas to Long term.

2.2. Olbia: European Technological Platform

The installation of a Multipurpose Center on a stretch of coast north of the Gulf of Olbia has forced instead to think in terms of the relationship between the architecture and the surrounding environment, strongly compromised in terms of urban planning and landscape connotations.
The project has therefore proposed to mediate the meeting between two environmental realities, (the natural residual and the invading industrial one), designing a place of comparison, of cohabitation, of dialogue, between apparently different but not incompatible systems. (Fig.4-5)
The layout of the designed buildings is conditioned by the desire to assume an explicit function of a visual screen vis-à-vis the neighboring production buildings and the industrial purification plant, above all, around which the complex is surrounded.
In this case, the preliminary design of the masterplan had to be compared with the possibility of "redeeming" this area from the cumbersome and harmful presence of the purifier of all the foul-smelling wastewater of the production complex that bears behind, in which some industries are established processing of fish and tuna in particular.
From the initial idea to build even above the purifier, then burying (as done with the Barcelona Esplanade) we have more concretely identified technologies capable of "sterilizing" the nauseating exhalations, covering the plant almost completely with a superstructure to support a photovoltaic field for the energy self-sufficiency of both the plant and the new settlement. (Fig.4-5)

Figure 4. Masterplan of the European Technological Platform of Olbia around the purifier (ZaniratoStudio).

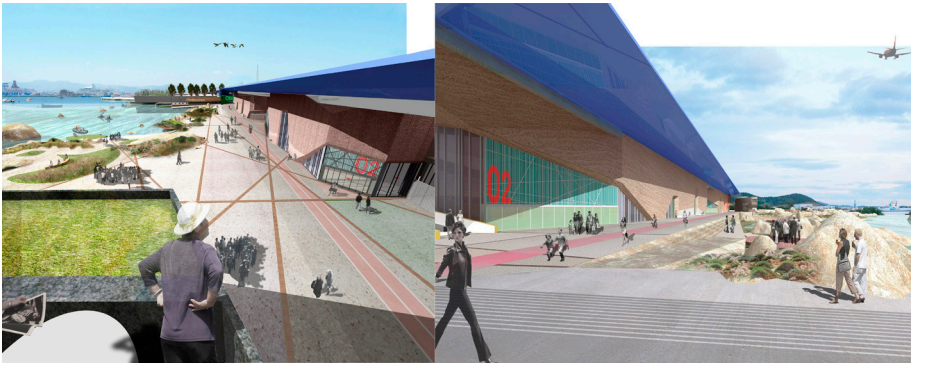

Figure 5. Waterfront of the European Technological Platform of Olbia (ZaniratoStudio).

2.3. Albania: Waterscape Scape Design

In Albania, planning strategies are being sought for tourism and unpredictable landscape mutations, caused by climate change: in practice, designing a hybrid system capable of responding to different coastal scenarios influenced by rising sea levels. The new architectural approach must be seen as an opportunity to experiment with design solutions in the Albanian Riviera landscape, protecting and enhancing its extraordinary beauty from the new looming pitfalls.

It is also a question of imagining alternative forms for living the territory: today in a manner compatible with agriculture and in a possible tomorrow in alternative ways and economies, starting from its accessibility and ability to move inside and to relate with the territories neighboring. (Fig.6-7)
The project proposals that are being evaluated will have to be able to imagine a geographic scenario "changed" dramatically giving solution to the future critical issues with a utilitarian and landscape sense already from now, therefore alternative.

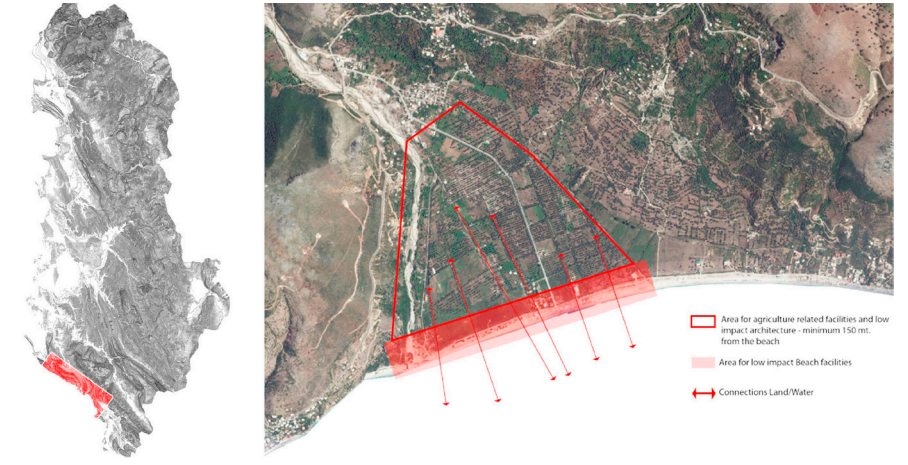

Figure 6. Albanian coastline at low altitude on the sea subject to strategic planning.

3. Conclusions

These examples, with all their relativity, demonstrate how much the architectural project today must be able to tackle issues much wider than those proposed by its functional program, taking charge of environmental solutions and urban and landscape maintenance, far beyond the disciplinary fields. In these cases, the project must take on the task of creatively tackling hypotheses of cohabitation with themes and techniques of a very different tone with respect to the formal composition and the constructive translation, and from this cooperation can emerge final solutions that are certainly unprecedented and necessary. Infrastructure, (2010)

It is possible to imagine scenarios in which the project must be compatible with unbearable noise levels, landslide and subsidence of the terrain, risks of storms and erosion, flood areas and risks of forest fires ... whose solutions intertwined can develop new and interesting resources.

All the actors of anthropic transformations should commit themselves to designing and planning buildings, landscapes and human settlements in a way that does not weigh on the current, already compromised, countering the environmental imbalance. Then develop strategies and tactics that can stimulate and govern a resilient metamorphosis of the city towards their self-defense, seen however as an opportunity to re-imagine more adaptive environments and a more sustainable world. Hertzberger, (2016)

Most of the "risks" that affect the inhabited places today are anthropogenic, that is they are the product of the way the cities were built and their metabolism has been consolidated: from hydrogeological and hydraulic risks to those related to pollution soil, water and air, micro-climatic risks, impoverishment of ecosystems and desertification.

The sudden break-up of the extent of risks, of climate change among them, underlined the cultural, interpretative and proactive weakness of these roots. The deterioration of the city's environmental conditions and the changes in the disruptive dynamics of water, soil, energy and waste cycles have fully shown the gap of awareness and experience between the different urban and cultural areas in Europe and in all over the world.

The project of transformation of the territory and of architecture should today present the theme of fundamental research on what, where and how to face implicitly an existing or imminent environmental problem: above all this should reside its contemporaneity.

Figure 7. Bosch's flooded beach in Albania.

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CHAPTER #4.10

URBAN REGENERATION OF PERIPHERIC LANDSCAPES. BASIS FOR A RESEARCH BY DESIGN APPROACH TO THE RECOMPOSITION OF PUBLIC SPACE IN SOCIAL HOUSING ESTATES OF VALENCIA

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1. Introduction

The research project here presented is located at the confluence of two thematic fields: the social housing complexes of the city of Valencia and the urban landscape. It is proposed, then, as a synthesis or hybridization between housing and urban landscape, two territories currently linked to ecological responsibility and also to social commitment, which must necessarily be addressed from sustainability parameters in an integrated manner.

The proposal of research in this synthesis territory is the consequence of considering that the main challenge of urban sustainability in the coming decades is, on the one hand, in the reuse of urbanized land and attention to the consolidated fabric of our cities and, on the other, in the integrated approach of urban, social and environmental policies.

The main objective of the proposed research is to outline intervention strategies, using the project as a tool, for the recomposition of the public space of social housing estates of the city of Valencia built between 1952 and 1978.

These social housing groups present two common features: on the one hand, they are all public promotion groups, designed in accordance with the principles of open order characteristic of modern urbanism; on the other hand, all of them are included in the Atlas of Vulnerable Neighbourhoods of Spain by Hernández Aja (2015).

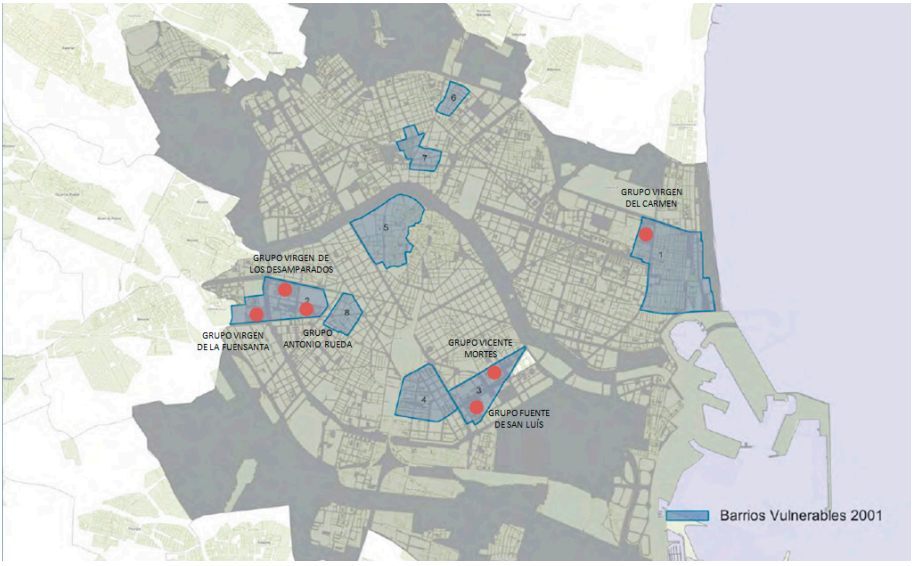
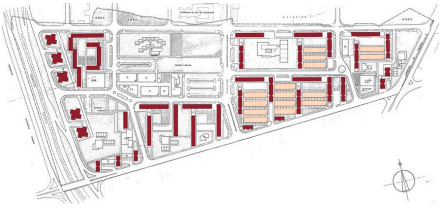
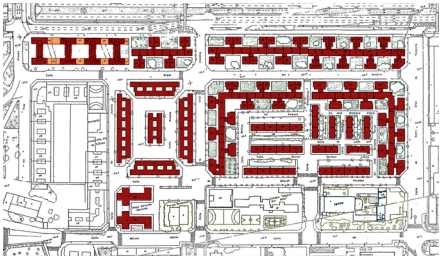


Figure 1. Location of the social housing estates proposed as case studies for the research project, on plan of the Atlas of vulnerable neighborhoods. Source: Hernández Aja et al (2015).

Mor specifically, the social housing estates of the city of Valencia proposed as case studies for this research project are the following ones:
- Area of Avenida de Castilla: Virgen de los Desamparados and Antonio Rueda housing estates.
- "Riada" Plan: Virgen del Carmen and Virgen de la Fuensanta housing states.
- Area of Monteolivete: Vicente Mortes and Fuente de San Luís housing states.

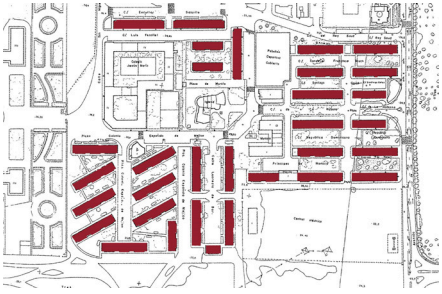


Grupo Antonio Rueda (1965).



Grupo Virgen de los Desamparados (1952-62).

Grupo Virgen del Carmen (1957).



Grupo Virgen de la Fuensanta (1957).

Grupos Vicente Mortes (1971-76) y Fuente de San Luís (1973-78).

Figure 2. Social housing estates proposed as case studies for the research project. General Plans. Source: Pérez Igualada, J. (2006).

2. Methodology: research by design

The research project aims to situate itself in a methodological field that in the academic literature usually receives the names of design research, research through design or research by design.

Research by design (RbD) is defined broadly by the EAAE Charter for Architectural Research as "any type of inquiry in which design is a substantial part of the research process" (EAAE, 2012). Some authors propose a more detailed definition: for Verbeke (2011), RbD is that type of research in which the design process and the experience derived from the practice play a crucial role in the research, not only as data to observe, but mainly as a method and result of the investigation.

Of course, the research must comply with all the rules that govern research in general, which Archer (1995) defines as "a systematic enquiry whose goal is transmissible knowledge: systematic, because it is pursued according to some plan; an enquiry because it seeks to find answers to questions; goal directed because the objects of the enquiry are posed by the task description; knowledge-directed because the findings of the enquiry must go beyond providing mere information; and communicable because the findings must be intelligible to, and located within some framework of understanding for an appropriate audience".

Architecture, urbanism and landscape architecture are design disciplines, in which design is an essential component. In RbD the design process -architectural or urban- marks a path through which new knowledge, ideas, practices or products are developed. Therefore, the results of the research are obtained from the practical experience, and are consistent with it.

Working from the design experience, however, implies a change in relation to the type of knowledge and understanding that results from the research. The focus is not on finding universal laws, but on studying the particular experience, the specific. As Verbeke (2011) and Archer (1995) point out, the findings of research through design, even if they are very specific to a situation and are only generalizable to a very limited extent, can be very valuable, since they provide some case material that could never be obtained in another way, which can advance professional practice and also serve as a basis for more general studies.

There are other aspects that characterize RbD, apart from its specificity. On the one hand, as Cook and Brown (1999) point out, in RbD the researcher is no longer a distant observer, but an intervening actor, who makes use of tacit knowledge, not explicit, and of the so-called "creative leap", aspects both inherent to the design , that allow to progress in a fast and effective way in a complex project. On the other hand, RdD can be associated with a type of knowledge production linked to applicability, in a transdisciplinary context, which involves academic researchers, professionals and social agents, and which Gibbons (1994) calls Mode 2 knowledge, Mode 1 being that of traditional sciences. In this context, RbD appears as a hybrid form of knowledge production, and as a method to achieve that the academic inquiry approaches the needs of the social reality.

Whithin this framework, the research project adopts a methodological approach to RbD proposed by Roggema (2017), who proposes a model integrated by three overlapping phases: pre-design, design and post-design, each of which has components of research and design. The first stage is of analysis, the second of projection and the final stage of evaluation or synthesis.

The RdD carried out within this methodological approach is a method that uses the design to investigate spatial solutions for a specific area, allowing to investigate their qualities and problems and test their spatial potential, assuming the freedom to move with the proposals in an unexplored territory, and producing new perceptions and interesting and useful knowledge for society.

3. Workplan

The research project, following the methodological scheme described before, is structured in three phases: a first of analysis, a second of design, and a third of synthesis.

a) Analysis phase

In this first phase, of pre-design research, the basic perceptions resulting from the scientific literature are complemented by the study of references of housing units and similar experiences, with the aim of characterizing the selected areas and preparing a diagnosis and some general criteria of intervention for them.
The systematic analysis that is proposed of the social housing estates in Valencia selected as a case study is, on the one hand, multiscalar, and ranges from the scale of urban insertion to the one of internal analysis. On the other hand, it is a comparative analysis of two temporal scenarios: the moment of the original project and the construction of the neighbourhoods, and the one of its current state.
For each of these two scenarios, the characterization of social housing units, as well as the diagnosis and definition of intervention criteria, is carried out in two areas:

-Building: initial and current configuration of the land form (plot subdivision) and the built form (buildings) both on the ground floor and upper floors; figure-ground plan of built and open space; sun parameters; uses of the ground floor; types of housing and buildings.

- Open spaces: initial and current land configuration; road layout and network of public spaces; green spaces and vegetation; water systems; permeable and non-permeable surfaces; spatial analysis of the urban landscape; social use of public space; connectivity with the urban environment.

b) Design phase

The specific objective of this research project in its propositive phase is to outline intervention proposals for the recomposition of the public space of the social housing units belonging to public promotion states of the city of Valencia. These proposals will be developed in the two areas already mentioned:

- Morphotipological recomposition: reconfiguration of plot division and built forms.

- Recomposition of the urban landscape: redesign of the public space from sustainability parameters, in terms of its social use, mobility, and functional and visual integration of natural processes.
The proposals must be developed taking into account the criteria of good practice commonly accepted in the scientific-technical literature for the actions of urban regeneration (Rivas, 2015). Based on these criteria, it is possible to make a preliminary approach to the program that should guide these proposals, which, for each of the two areas mentioned, should contemplate in principle the following actions:

b.1) Actions linked to the morphotiphological recomposition:

- Recomposition of urban units to shape urban blocks, associating isolated buildings by means of fencing techniques or the introduction of built-up linking volumes.

- Hybridization actions in housing buildings, with the introduction of new uses, such as commercial ones, for the activation of ground floors.

- Introduction of new building (bands and built volumes attached, to provide a functional and bioclimatic improvement of dwellings).

- Delimitation of intermediate free spaces, for private / community use, linked to the ground floors.

- Introduction of new equipment if necessary, and improvement of their integration in the internal urban structure.

b.2) Actions linked to the recomposition of the urban landscape:

- Promotion of integrated mobility: universal accessibility in public space, with priority to soft mobility and reduction of space for parking on the streets.

- Improvement of the material and spatial quality of urban design: spatial and functional continuity of streets; system of interconnected open proximity spaces; improvement of the material quality of the urbanization; design of public spaces as support for community life.

- Integration of urban environment and natural processes: incorporation of vegetation in the road and free spaces, use of permeable soils and other sustainable urban drainage systems; incorporation of productive landscapes.

- Connectivity actions: Permeabilization of the edges and promotion of continuity between the internal spatial structure and the urban fabrics of its surroundings.

The two types of actions involve interventions on the existing public space, either to occupy part of it by built volumes or by spaces of private or community use, or to modify the design of the surface that remains as a land for public use.

c) Synthesis phase

It includes three tasks related to design processing: the evaluation of the project proposals through indicators, the comparative analysis of the proposals and, finally, the communication and dissemination of the results. The expected content for each of these works is as follows:

- Evaluation: The proposals made will be evaluated, using recognized reference indicators, such as those used by the Certification of Ecological Urbanism or LEED v4 for Neighborhood Development (2009). This will make it possible to contrast, on the one hand, the degree of applicability of the indicators in relation to specific urban projects and, on the other, the validity of the proposals in light of their adjustment to those indicators.

- Comparative analysis: On the one hand, the proposals are compared among themselves, examining similarities and differences, and extracting particular conclusions for the specific case of the social housing groups of Valencia. On the other hand, these proposals are compared with those made in other places, with the aim of identifying, where appropriate, guidelines or generalizable solutions that can confirm those already included in good practice manuals or dismiss them.

- Communication and dissemination: The results of the research should be structured as a work or set of standard scientific works, which includes both the project proposals made as their evaluation and comparative analysis, and which, by providing a better knowledge of a specific situation, can form part of the materials that feed further research with a more general purpose.

The "theoretical design" elaborated on the basis of the research by design methodology, as a research tool, is first a test bench, a place in which to explore through design the applicability of the performance criteria included in the manuals reference of good practices. In the post-design stage, the theoretical design, once elaborated, becomes an object of study, to which we can apply the same methodologies of analysis used for a material object: research becomes research *into* design, and it is developed according to the common parameters of the scientific method.

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CHAPTER #4.11

THE NEXT MOBILITY ADVENTURE

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1. Introduction

The road as we know it today has contrasting relations with the territory it runs through: a line that connects two points with each other. Dividing and joining simultaneously, like a virtual line of connectedness. Every road can therefore be considered like the relationship between an ephemeral size, its section, and an infinite size, its length, biunivocal.
Roads often cross territories, dividing them according to a logic completely extraneous to their nature. Today, the conception of the road, as a connective, is trivialised like traffic collectors and nothing more, confined to solely functional tasks. Roads are becoming more and more estranged from both the design of the territory and the urban space, making them incompatible as representations of key collective spaces. Ventura (1996)

As a consequence, the road loses the value of place, flattening itself in order to serve only as a transit between the two roadsides, especially if built on. And as was already the case with the railroad, high-speed roads are an effect of extraterritoriality due to single-use, specialization and speed, making functional relations difficult with the territory crossed. No longer being a place of intersection and exchange with other experiences, the road becomes a landscape itself, rather than a point of observation of other landscapes. De Pieri, Scrivano (2002)
The modern crossings are so distracted, insensitive to the penetrated thickness, almost "absent" and apathetic in the spatial relations touched. The urban spatiality is contracted in the great internal spaces, in enclosures, while our life flows on the distances, in the movements. (Fig.1)

Figure 1. Reggio Emilia (Italy), Mediopadana Station, S.Calattrava.

In the contemporary era, the streets have become a sort of space that is physically continuous and homogeneous, like the seat of a collective experience distinct from the community. A location where there is a separation between a private interior and a public exterior, and not a transitional space between the two.
The prevalent size of the movement involves the predominantly longitudinal use of the carriageway, neglecting the dialectic relationship with its sides. (Fig.2).
We always think of the road, above all, for what it leads us to see, often forgetting that it is itself something to be seen, a constitutive element of the pre-eminent characteristics of a given place. Zardini (2003)

More than just the shape of the road, its morphogenic structure and design should attract our attention, turning it into its own specific location. Consider how the motorway constitutes a delimited system, regulated by particular rules and codes. (Fig.3).
The small size of the European landscape, densely built up, also requires the motorway to be detached from the territory and estranged from the delicate historical context that they are built around, protecting them from the various forms of pollution.
The cities are less and less passed through, but urban and architectural treasures are reported, shown to the traveller via posters, trying to briefly describe what can not be seen, to help the traveller imagine what they are missing. (Fig.4).

Figure 2. A1 Bologna-Firenze (Italy), highway noise barrier.


Figure 3. Utrecht (Holland), highway noise barrier.


Figure 4. Utrecht (Holland), highway noise barrier.

Finally, the problems related to noise pollution have accentuated the isolation of the infrastructures in relation to the city, with the implantation of different protective systems, but still identifiable like trenches that deny their belonging to the urban scenario.
The sound-absorbing barriers, in their various styles, make motorists aware that they are driving through an inhabited area, which, however, can hardly ever be seen or recognized. As a result, the space of the fast-moving traveller is increasingly opposed and incompatible with that of the communities they are crossing, where the proliferation of barriers and / or shields run along the main arteries.
This change in the road scenario is almost exclusively due to the implicit problems induced by specific types of transport vehicles -fossil combustion engines, manual or semi-automatic. Noisy, highly polluting and dangerous. But all this is coming to an end and we are moving on to a completely different vehicle category -non-polluting and completely automatic, meaning that the road scenario will have to be reconfigured accordingly.

2. Smart mobility

In addition to connecting, transport systems can they themselves become linear relationship structures and services in order to distribute the interests on the territory in a more balanced way and relieve the pressure on the connected urban poles.
In the widespread city some of the new central locations are just connected to infrastructure, like many of the tertiary or playful recreational activities, which leave the city consolidated to reposition itself along the main communication axes, the only ones with which they establish environmental relationships.
The infrastructure space is also one of the most representative public spaces in the shut-in landscape of contemporary urbanization. These include some of the new monumentality of the contemporary architectural scene. Ferlenga (2012)
Visual poles that orientate the directions of territorial crossing, from the street elevations as large signs, which capture the attention.

Today, therefore, awareness is spreading that new mobility also requires a different approach to the city and its design, given that the electrical infrastructure contributes to the (re)definition of urban space. New electric mobility, as well as connected, shared, multimodal - is in fact part of new cities and towns being built. Ciorra (2013)
We must all contribute to modeling a new urban "ecosystem", knowing that vehicles of an imminent future will be able to provide a multitude of on-demand services, at the client's request, with a series of benefits: traffic reduction, faster deliveries, and most importantly, improving air quality.
For this reason, cities must change their approach and let technology help them in understanding where and how to intervene, aiming at having as primary objective the restitution of the space granted to roads, designed for cars, returned to citizens and their ever-growing needs. (Fig.5)

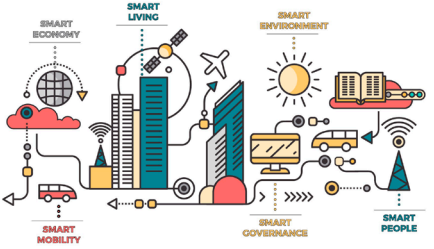

Figure 5. Smart Mobility and Economy in the Samrt City.

We are conquering, at an ever increasing rate, an epochal revolution on the whole territorial mobility system of people and things:

- the abandonment of propulsion systems based on fossil fuels is a sure thing, being in favour of renewable energy, making traffic no longer "a pollutant", but almost silent and discreet, compatible with the environment that it is often segregated from (with artificial barriers and tunnels);

- the automatic driving of private transport vehicles will make the journey an experience as "relaxing" and safe as public transport, thus reducing the safety devices on the side

of roadways, promoting forms of "street" cohabitation;

- the use of drones for small postal deliveries will greatly reduce ground traffic which is becoming more and more congested due to the increase of e-commerce. They will also be interfaced with the automatic driving of private vehicles (auto-delivery). Fierdman (2011)

3. New urban logistics

In this foreseeable scenario, the same roads will then be reconfigured with greater adherence to territories they cross because they will then no longer be a source of disturbance and forced "separation", recapturing a lost involvement.
Motorway service stations will have to take on different roles, offering a wider range of services and assistance (show-rooms and vehicle maintenance-repair workshops):

- vehicles powered by renewable energy will need "recharge" stops with different methods and timing, but in any case short and instantaneous. It will be easier to consume meals actually in the vehicles on the move and therefore to obtain supplies "on the fly" also for consummations);

- the autonomous private vehicles will optimise the approach of parking in a planned manner, limiting the occupation of land, allowing the possibility of having more space for public green areas;

- these widespread technical areas throughout the territory can become hubs of exchange between sorting with heavy vehicles and the delivery "messengers" (drones or autonomous driverless private vehicles).
In this scenario, the motorway service stations, but also those urban and widespread in the extended territory, will become more similar to airports and interports, exchangers serving not only travelers but also and above all portions of metropolitan areas, small cities and territorial areas of influence, creating a system of "Cells" of relevance for the new logistics.
There are three different types of road supply areas: from individual pumps to small equipped service stations, passing through the most widespread fuel stations, and all can be converted to obtain a network of urban services.
The imposing road network that runs through our territories has to charge, becoming a complex and connected system that will redesign mobility through new infrastructures, new forms of sharing, new opportunities to reduce dead times in traffic and, above all, new types of vehicles.
Future generations of self-driving cars and commercial vehicles will certainly strengthen the use of innovative vehicles for home delivery of various types of goods, with the aim of making the impact of self-driving cars more and more socially appreciable in the community.
Therefore, new mobility is not just technological innovation, but a change in lifestyle, means and services. Ways of doing business in urban spaces and service facilities. As the car has shaped the city of the 20th century with all its distortions, the new mobility systems of the new millennium could redefine the use of urban space with a new, more balanced footprint. Ratti (2017)
New mobility could allow us to drastically reduce the total number of vehicles in circulation and free up large areas of the city, for example parking spaces, which could then be put to other uses. The foreseeable service stations as hubs of widespread freight delivery would also be key players in achieving this goal.(Fig.6)

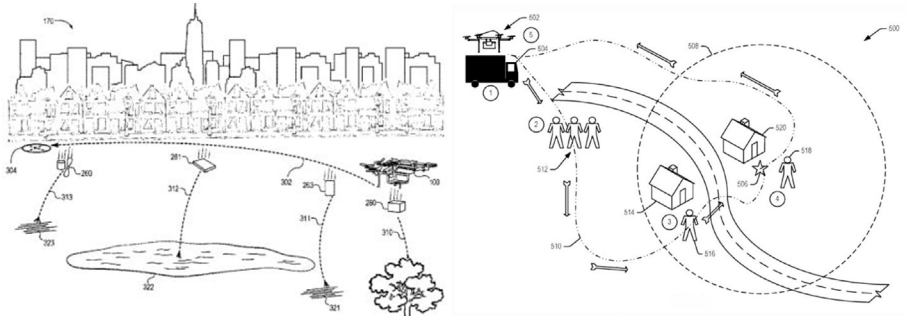

Figure 6. Patents for postal delivery with drones.

The possibility of receiving shipments directly to any given place, among other things, is not just for convenience, but can also cater to real needs such as the delivery of a first aid kit to a hiker, or an inner tube to a cyclist who gets a puncture, or to send basic necessities and medical equipment to victims of natural disasters or other dangerous situations. Delivery to isolated areas difficult to reach in some periods of the year or the marketing of agricultural "zero kilometer" products.
The possibility of using drones in some situations is interesting: this technology can be very useful in the warehouse automation process, useful for fluidizing and speeding up processes.
Also some types of deliveries could benefit from this method: think of the isolated areas, difficult to reach in some periods of the year, or the mini routes between the logistics hub and the lockers.
Drone's could make a significant contribution to optimising the entire logistic chain, the last mile, warehouse management and urban distribution. (Fig.7)

Figure 7. Home deliveries with automatic vehicle or drone.

4. Conclusions

At the time of the global financial crisis, a mechanism of "regeneration" of resources and ideas was triggered - a phenomenon that Joseph Alois Schumpeter, one of the major economists of the 20th century, called 'creative destruction': "the process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one."
It is this process that leads to the emergence of the sharing economy. An economy based on collaborative consumption where the value of possession gives way to that of use. The translation of this trend in mobility leads to a considerable reduction in the number of means of transport owned and often unused, therefore with much lower numbers of vehicles in circulation and fewer urban areas occupied for long (parking) periods.
In this scenario, the automotive service stations are candidates to become "exchange squares" (the new "post stations") for the sharing of private vehicles and the activation of taxi-drone services.
Such opportunities will be needed in the development of societies without distance, an economy in which there is no longer a difference between the ordering of goods, be them digital or physical.
This remarkable result, already technologically feasible, can only be achieved with the collaboration of everyone and the synchronisation of the many authorities that intertwine in governing the cities in terms of juridical, economic, social and cultural requirements and conditions. Disciplines with different roots and opposite tendencies which have made the towns and cities of the last century

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5

BLOCK 5: BUILDING TECHNOLOGY AND ADVANCED MATERIALS

INTRODUCTION TO BLOCK 5

(RE)…
TOWARDS NON-STANDARD CURRICULA IN ARCHITECTURAL EDUCATION: THE IMPACT OF A NEW MATERIALITY ON ARCHITECTURE AND ITS EDUCATION

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Introduction

The materiality of architecture has been for long understood as the tangible manifestation of ideas and values embedded within and translated into built form. The nature of the materials deployed, and the construction methods or the building technology at play, are the mediators between the mental and the craft activity to attribute to form its aesthetics. For the utilitarian approach of the anonymous vernacular architecture of the agricultural societies, the question of blending into the material context is not a choice but a given, based on the availability of indigenous materials in situ and on traditional construction methods passed from one generation onto another. Human labour combined with intelligence and inventiveness, two other immaterial entities, are all invested in the making of tools to harness the materials' idiosyncrasies. The technology of tool making would advance insofar as it would adequately deal with the material at hand. Earth, stone and wood either in exclusive use or combined, fuelled the material repertoire of the materiality of the vernacular. Worship that had to be manifested through building high and long span was what led experimentation of building with compounds such as a primitive form of concrete from as early as the times that emblematic building such as the Pantheon were constructed.

Alien materialities, come about as a result of employing materials far from their raw form as layers of geological strata, as a result of the need to build high rise urbanities following the shift from agricultural into industrial and industrialised societies. Advances in railway transport of goods allowed materials to be taken to long distances, becoming available in alien to their origin locations. Bridge building, a demand for even longer travel coverage of goods, including materials, became necessary and possible with the use of these material that could travel long distances and span long. The invention and the use of machines to extract from the earth, to orchestrate production line by elaborating raw material compounds in the industry and then dictate the construction sequence to build in situ, have all been associated with the extensive use of concrete and steel. New materialities that emerge as a result of problematizing the role of architecture in the environmental crisis, or as a result of exploiting new manufacturing techniques that have been mostly adopted from other than building industries through experimenting with innovative formalism, have repercussions in the way architecture is nowadays created. Should that not affect architectural education? The essay that follows is dealing with this crucial question.

(Re)considering 'making' in architectural education

Architecture, as a cultural statement and manifestation of our life in space and architectural education as the institutionalized practice assuring skills and competences for this statement and manifestation, seek new considerations compatible with the fluid environment of globalised economy and information society. They must both constantly elaborate, redefine or restructure their framework of values and principles, knowledge, skills and competences, tools and means, as well as priorities and preferences, formulating innovatively the contemporary architectural paradigm. New terms, notions and concepts are constantly appearing in our architectural vocabulary. Liquid, hybrid, virtual, trans, fluid, emergent, animated, seamless, interactive, parametric, machinic, self-generating, are all new

terms introducing a new culture where change is replacing stability and solidity and complexity are replacing simplicity and clarity –terms and values that have nourished architecture for centuries.

Nowadays, the central role of IT in both generating a form and turning it into a building seamlessly, the complexity of a world informing design and construction, the galloping technological advances in building techniques and the emergence of new materials and components render the issue of reconsidering architectural education more acute. The emerging paradigm of parametric architecture has brought about a radical change to what we have been accustomed to until it turned up[1] ; that is, the transformation of values such as mutability, 'adaptivity', transformation, flexibility, affordance, individualization, personalization, customization, intelligence and ecology into built form. A new perception of materiality is therefore called in to accommodate the transformation of the unstable into a new perception of construction, detailing, and nodal points and to redefine established perceptions of the building as a whole.

Despite the conscious efforts to embrace the issues of materiality and of 'making' in architectural curricula, in most cases graduates lack the necessary skills and competences that could enable them to turn their ideas into buildings. Compromising the continuity between idea and building has always been a common struggle and challenge for architects of all times. Even in the most renowned schools of architecture, where the necessary infrastructure is at the disposal of all students, and the courses are tailored to explore and achieve this aim, continuity is only achieved at a level of simulation and rarely at 1:1 scale. Even when the operational scale is 1:1 the outcome is rarely tested to real conditions of loading, weatherproofing, sustainability, material properties and the respective failures etc. Moreover, new non-isotropic materials, the materials that open up to new possibilities to structure complex non-linear forms are hardly ever explored.

The above-mentioned change is accompanied by another one, which concerns the non-Euclidean geometry and topology, the rules of which are followed by the emergent architectural forms. The proposed forms, in their majority, cannot be materialized with the existing building industry equipment and infrastructure. The products of these traditional building industries have constituted for years the content of construction courses in schools of architecture, and they have been explicitly described in the relevant bibliography or presented as construction technical libraries in the schools' construction workshops, testing structures and conventional materials and techniques.

The non-standard forms generated in the new architectural paradigm presuppose a customized production of components, rendering the existing knowledge on traditional materials and techniques practically irrelevant. In this context the emerging necessity is for architectural education to incorporate knowledge and experiences, unattainable from the digital simulation, infrastructure schools often have at their disposal. Such necessity can be accomplished through the collaboration between schools and technologically-advanced building industries. Nowadays, in the world of contemporary construction there are industries and enterprises that come into the design and construction teams to act as agents or transformers offering their expertise and functioning as mediators that can rapidly make a prototype to test and eventually customize the entire construction of a building[2] .

From the above-described conditions a fundamental question emerges: How can we teach the materiality and the construction of the architectural forms of the new paradigm? It becomes apparent that there is a need for a

[1]In the Modern paradigm the clear-cut distinction of the parts of a building associated materiality with the idea on the unique resolution of nodal points that connected the parts, all assembled producing the overall building. The transformation of the values of the given intellectual and cultural context of democritisation, internationalization, and the perception of the human being as a regular modular but central in world was achieved with the use of standardized components made of not so traditional or local to the building site materials. Edward Ford, *The Details of Modern Architecture*, (Cambridge: MIT Press, 1990).

[2]Known for their crucial role in contemporary constructions are companies such as Gehry Technologies (http://www.gehrytechnologies.com/) and Materialise (http://www.materialise.com/)

new teaching protocol to be defined in which direct contact with the real production process of customized components is necessary; a new relationship between schools and building industries has to be established.

(Re)viewing academic freedom

Architectural education has always been close to, if not (in some cases) depended upon, the building industry and professional practice. As autonomous institutions or as part of Universities, Technical Universities or Fine Arts schools, Schools of Architecture had always very delicate relationships with the so-called market, challenging the fragile limits of the notion of 'academic freedom', a fundamental principle and the moral basis upon which the Western European academia was founded since classical times. As a term 'academic freedom' expresses the will and the necessity of the academic community to remain the institutional knowledge generator untouchable from the logics of any political, financial or corporal profit. Do the fast changes taking place in contemporary life accelerated by the use of advanced information technologies render the principle of academic freedom more vulnerable? Partnerships between schools of architecture and the building materials sector is not only encouraged by the political context[3] but appear, as mentioned above, as a necessary condition to educate architects in the new materials and the new construction techniques. The claim for enhancement of the collaboration between schools of architecture and professional bodies is not only expressed by professionals, but also by schools[4] as the necessary condition to monitor speedy changes. In parallel, the more the design and fabrication is digitalized, the more the dependence of the design and fabrication process by certain specific software appearing in the market seems inevitable. The plethora of these prefabricated digital environments, as we will see, far from being neutral, innocent and profitless, oblige the majority of institutions, which do not have the capacity to develop their own digital platforms to become passive consumers of market products. It becomes imperative for schools of architecture to develop a strategy against this situation and to try to generate their own digital environments produced on values and principles more compatible with their research interests, theoretical premises and value system reflecting their own identity.

(Re)forming for a customized individualism

Nowadays, we are moving towards an increasingly individualized society. Individuals seem to be progressively losing their collective consciousness. We are experiencing an individualization of our social behaviors, preferences, choices, and expectations. The more we individualize our social presence and escape from the formerly established collective norms by personalizing our everyday objects, the more the customization of industrial production of these objects becomes the prevalent strategy of the industry. In this context, the individualized-customized part tends to become an autonomous component of an unpredictable whole, dependent upon the emerging dynamics of unstable and variable parameters. The more obscure the whole, the clearer the part; the more we can contemplate and formulate the part, the better we can conceive the whole.

In contemporary architectural creation the detail increasingly becomes a crucial issue of architectural quality[5]. Building components are very often designed autonomously, regardless of the final form of the building. Architects organize the design proposals on the basis of adaptability, transformability and flexibility of the building components. In this case the design of the building tends to start from the design of these components and not vice versa. The generic design of a component parametrically allows the manufacturing of unique elements that follow the same logic and structure but

[3]Typical case are the EU educational programs like LLP and IASTE as well as the generalized in European level internship.

[4]See Chania proceedings of the last three years where Heads of schools declare the need to schools of architecture overcome the isolation and to establish collaborations with the professional bodies.

[5]Kas, Oosterhuis, Hyperbodies: Toward an E-motive Architecture, (Basel: Birkhaeuser, 2003)

possess different positions in a complex, multidimensional form.
If we accept that the file-to-factory process introduces a new way of making and materializing buildings, we have to accept that it introduces, in turn, a different process of designing forms and consequently a different way to teach architectural design and construction.

(Re)structuring architectural education system

Although society is more apt to embrace changes, schools of architecture interestingly enough remain somewhat resistant to the avant-garde. The speedier the diffusion of the new in the academic environment the more fragmented and partial the education. The emerging architectural paradigm is based upon the extensive use of digital technology through which forms are generated as the digital representation of a script articulating modifiable parameters depended upon predefined relations. In this reality, the teaching of architectural design is often dominated by the technical aspect of the use of software or the creation-modification of this software. This fragmented approach to the new, encouraged by the fascination for the forms created by digital means as expressions of an 'other' promising world, turns students often towards a formalistic aspect of architecture, disconnected from a theoretical discourse and a consistent content of their design proposals. How can we, the teachers, teach our students to translate the new set of values of our society into architectural principles and then into architectural designs without being 'imprisoned' in the technicalities of scripting or software applications?
It appears that we need a radical transformation of our educational system in order to be able to teach the new paradigm properly. How easy is it, and to what extent is such a project feasible? Should we wait for such a reform or is the ground already prepared for action and initiative for an operational teaching of f2f processes?
In principle the file-to-factory processes are the ultimate and closest means to a seamless and continuous connection between design, manufacturing and construction. They are the direct and uninterrupted diffusion of an idea that encapsulates the values of an intellectual system *vis-à-vis* materiality, or the translation of values into built form. However, is it possible to teach the seamless in an extremely fragmented educational system implemented under the label of modularization in almost all schools of architecture? Both educators and students appear to be consciously or unconsciously detached from this seamless connection. The demand for continuity very often turns into an exercise where manufacturing non-standard forms is an end in itself. Contemporary architectural education has not as yet identified how this new conception of creation and materialization of architectural forms can be positioned in the existing school curricula.
In fact, our existing educational system is constructed on the basis of a process, where architectural knowledge as a whole is split into smaller subject areas, which are further split into smaller courses and modules, thus creating parts which have to be taught in order to reconstruct the fragmented whole of architectural knowledge. In this educational environment, the conception of continuity, articulation of knowledge and experiences, are rather absent. Schools have difficulties controlling how the synthesis of students' knowledge could be achieved most appropriately and systematically. The system can only evaluate a result of articulated architectural knowledge which has built up in students' minds and consciousness, but which has never been systematically taught or strategically organized. Fragmentation is a fact not only in the form of organization of studies but also as a kind of viewpoint in educators' consciousness and, to a certain degree, in students' perceptions. A direct consequence of this perception is to consider this continuum as a unification of fragments and not as a unique, seamless process. The fact that different professional bodies and specializations are involved in this process makes it more difficult to overcome the handicap of fragmentation.
It appears to be necessary to open up the debate on reforms of our educational practices in order to make our institutions more responsive to the new, innovative and emergent in architectural creation.

(Re)thinking materiality in architectural education

The file-to-factory process is a *mode de production*. As such, it is already implemented in many sectors of industrial production using materials that belong to the traditional palette of materials familiar in the building sector. Therefore, our educational system, which founds its teaching on existing materials, can rather easily incorporate f2f practices and familiarize future architects with this mode of production. Even if f2f has a significant efficiency with the existing materials, its operational value is mainly based upon the enormous possibilities it can develop through new and non-standard materials. By incorporating in its capacity both standard and non-standard materials, f2f appears to represent a mode of production which, supported by the advanced technological developments of our times, broadens the spectrum of production possibilities and, in this broadened spectrum, the standardized is just a small and less significant part. We can easily recognize the accordance of this condition with the parametric worldview according to which, the standard is just one version of the parametric and not necessarily the most appropriate or the most valuable one.

This worldview affects also the conception of the relationship between matter and form. Any material is conceived now as having endogenous tendencies and capacities (affects). Simple materials have inevitably simple capacities and tendencies, which restrict what DeLanda[6] defines as 'self-organizing capabilities of matter', but complex materials are those in which many things are left 'active and affective', non-linear and closer to form the topological rather than the geometric representing what Deleuze[7] defines as "hylomorphic model". The latter have complex and variable behavior raising their morphogenetic potential. This potential is a core concept in the way that the new paradigm perceives materiality since it manifests the continuously variable behavior of the matter as a value, assuring the continuum between form and its generation through the exploration of its materiality. Form is conceived now as teased out of an active material and part of its design is to define the properties of continuous variation of its materiality[8].

This new conception on materiality opens the way toward the use of new materials and, more often, composite ones with specifically designed properties, accompanied with a strong tendency for experimentation and innovation. Many educational environments have already absorbed this tendency by declaring the experimentation on forms and new materials as one of their educational priorities, and defining innovative and creative thinking as the most significant competences of future architects.

(Re)integrating making-thinking-culture

With the infinite possibilities offered by contemporary construction technology the constraints of materializing a form are no longer part of making a concept stronger[9]. Given the eternal loop and vicious circle where technological advances have cultural effects and that societal needs push for technological innovation, the emerging question is: how can we not lose track of the real cultural content of architecture 'seduced' by the power of CNC machines to manufacture anything conceivable? How can architects translate technological advances into innovative designs that produce lasting and significant cultural effects?[10] How will students or rather future architects not become the (neo-)Arts and (Digi-)Crafts[11] people of contemporary times?

[6]Manuel DeLanda, Material Complexity, eds. Neil Leach, David Turnbull & Chris Williams, in Digital Tectonics (London, Willey Academy, 2004), pp. 14-21

[7]Gilles Deleuze and Felix Guattari, *A Thousand Plateaus* (Minneapolis: University of Minnesota Press, 2002), p. 408

[8]James Edward Gordon, *The Science of Structures and Materials*, (Scientific American Library, 1988), p. 135

[9]Jean Baudrilliard and Jean Nouvel, *Les Objects Singuliers*, (Paris: Calmann-Levy, 2000), p 16

[10]Ali Rahim, *Catalytic Formations*, (N.Y.: Taylor & Francis, 2006), p 11

[11]Unlike Bonwetsch, Gramazio and Kohler us of the term 'digital craft' the term here is used for its derogatory implications and connotations to thoughtful architecture, see Tobias Bonwetsch, Fabio Gramazio & Matthias Kohler, Digitales Handwerk, in Nonstandard structures, GAN, Architecture Magazine 06, (Wien, N.Y.: Springer, 2009) pp 172-179

In the history of architecture the relationship between thinking and making has been challenged between extremities of total isolation to total integration. There have often been conflicts between thinking and making architecture to the extreme of one overshadowing to invalidating the other. On the one hand, the 19th century Arts and Crafts Movement was primarily focused on the tangible qualities of craftsmanship. On the other hand, new ideas on architecture that were never built were dismissively[12] characterized as 'paper architecture' (Utopia[13]).

The industrialized economy in the Modern movement introduced an interesting articulation of these extremities. Industrial production, according to Le Corbusier is not the production of objects but a world of intellectual constructions, of formal languages and information[14]. This new relationship between materiality and the intellect, between craftsmanship and thinking processes, seems to be under redefinition in the non-standard architecture and, at this crucial moment, it is imperative to support, enhance and sustain the thinking process as the necessary regulating factor in the loop between technology and culture. The emerging question is: how can we teach our students to become agents of the loop between technology and culture?

Nowadays, we can observe a progressive impoverishment of the humanities in architectural curricula, which, in most of the cases, are replaced by modules related to more technical developments of IT applications to architectural design and construction. The humanities have significantly lost their role in the design decisions. Cultural sensitivity and particularity, which dominated architectural design in the seventies and the eighties, have disappeared from the architectural discourse, legitimizing designed buildings. In most publications the contents focus on the process of generating non-standard forms and marginally refer to the social and cultural impact of the outcome of this process. If our educational system is becoming more technical, procedural and intuitive how can we then efficiently cultivate and develop creativity and innovation?

Can innovation stem from a technical thinking alone? Can competences that encourage innovation be assured in an educational system with the humanities marginalized? Established educators such as Ken Robinson[15] agree with a recent survey by Newsweek[16] that the association of ranking mathematics and sciences as the top subjects in the education of future innovators is wrong[17]. In acknowledging the inherent complexity of our times and, without undermining the invaluable contributions made by distinguished scientists and engineers, Alan Brinkley remarks that this world would be unimaginable without the great works that have defined culture and values. In his article "Half a Mind is a Terrible Thing to Waste"[18] his suggestion to all educators, clearly architecture educators included, is the balance between

[12]In her course "Archigram and its Legacies: London, A Technotopia", Annette Fierro discusses the preoccupation of Archigram with technology: "Coming into the present day, Archigram prophesied, to an uncanny degree, the extensive use of technologies that are environmental, or based in information and communication, and mass fabrication in new materials of organic or plastic characteristics"

[13]Manfredo Tafuri, *Architecture and Utopia. Design and Capitalist Development*, (MIT Press, 1979)

[14]Le Corbusier, *Towards a New Architecture*, (New York: Dover Publications, 1931)

[15]http://www.ted.com/talks/lang/eng/ken_robinson_says_schools_kill_creativity.html. Sir Ken Robinson in his lecture at TED explains that intelligence is diverse, dynamic, interactive and distinct while creativity is the process of having original ideas that have value. He stresses that only the acquisition of skills in maths and sciences is a hindrance to creativity as their prioritasation in the education globally is artificial and derives from the needs for highly numerical scientists to be employed since 19th century Industrialism and has not been re-considered since.

[16]The survey indicated that the Americans are losing ground in their ability to innovate, as opposed to the Chinese. The possible explanation is that the former place the emphasis of their education on maths and computer sciences (52%) and undermine the creative approaches to problem solving (18%). The Chinese believe that in order for their children to drive innovation they need to cultivate their skills on creative approaches to problem solving (45%) and less on maths and computer sciences (9%). Daniel McGinn, The Decline of American Innovation, in Newsweek, November 21, 2009, pp 32-37

[17]That has been a hot topic for a long time: Cyril Stanley ('Matter Versus Materials: A Historical View', in A Search for Structure, Cambridge, Mass: MIT Press, 1992), a historian of materials describes in his book the erroneous clear-cut distinction between craftsmen and philosophers from ancient Greece that was soon dissolved when science was more keen on looking into the 'problematic' topological versus the 'axiomatic" structures as described by Gilles Deleuze and Felix Guattari in A Thousand Plateaus (Minneapolis: University of Minnesota Press, 1980) p 411.

[18]Alan Brinkley, Half a Mind is a Terrible Thing to Waste, in Newsweek, November 21, 2009, p 45

equally cultivating the sciences and humanities that put the world together[19]:

(Re)building the technical infrastructure in architectural education

Would schools of architecture that possess the most advanced CNC machinery and offer their students possibilities to even construct their own machines for a given, unique design question, put forward better architecture than schools that do not?

The creation of prototypes and models for testing of design proposals has always been a significant part of the educational process in all schools of architecture. 1:1 prototypes, no matter how timely and crude, have always been a means for this testing[20]. Architecture in its attempt to strive for innovation has always proposed unprecedented ideas that only if not failing in their testing could be established as good and genuine. Rapid prototyping has certainly the merits of speed and accuracy but its high cost does not allow for repetitive testing. On the other hand the number of students in schools of architecture in most cases does not permit them to have access to this infrastructure due to the time and cost limits imposed by the time schedule and the poor finances of schools, at least at undergraduate level.

Contemporary machines can certainly produce complex forms in prototypes for testing. However, what differs in the non-standard architectural forms is that for each building there is one parametric detail which Oosterhuis, defines as 'universal'[21]. Testing an idea through testing its unique parametric nodal point is a new and interesting concept of turning construction of elements into the manufacturing of parametric components to be assembled.

It becomes evident that for schools of architecture there is a broad spectrum of possible experimentations with the new technologies using a big spectrum of digital infrastructure. An interesting sample of this spectrum was revealed to us through an educational experiment ran for two years among seven schools of architecture and fifteen industries aiming at developing and investigating the file-to-factory process as an educational issue[22]. The generation of forms achieved in most cases through existing software had direct conversions into files readable by the CNC machines. Such cases were the use of Autodesk MAYA software package that was then indexed in an AutoCAD vector file, McNeel Rhinoceros and then into 3dm, .iges files, Autodesk AutoCAD and then into .dwg, .dxf files. On other occasions the mechanical system was developed concurrently with, and informed by, its parametric digital equivalent in Bentley Generative Components, to test the results of initial parameter settings on an overall form. The structure was coded by a genetic algorithm (GA), a computer-based optimisation technique for modeling a system that exhibits ability for adaptation to an environment by allowing the inheritance and improvement of structural features. All code (for GA, analysis and production of construction documentation) was written in Processing. Other partners used Virtools for rule-based design. In preparation for getting to the CNC workshop and at the CNC workshop itself, Rhino3D was used for modeling and fabrication.

In lightweight textile structures WinTess software was created (taking into account the particularities of lightweight structures, minimal surfaces, Alistair Day's theory of Dynamic Relaxation, etc. such as a tool to design, analyse and construct them). The machines used overall were CNC cutting routers that received

[19]Along the same line Alan Nevins asserts that for him, "the humanities are not simply vehicles of aesthetic reward and intellectual inspiration, as valuable as those purposes are. Science and technology aspire to clean, clear answers to problems (as elusive as those answers might be). The humanities address ambiguity, doubt, and skepticism -essential underpinnings in a complex and diverse society and a turbulent world.....it is almost impossible to imagine our society without thinking of the extraordinary achievements of scientists in building our complicated world. But try to imagine our world as well without the remarkable works that have defined our culture and values. We have always needed, and we will need, both." Alan Brinkley Half a Mind is a Terrible Thing to Waste, in Newsweek, November 21, 2009, p 45.

[20]Brett Steele, Prototyping Architecture's Future, Again, in Manufacturing Material Effects Rethinking Design and making in Architecture, eds. Branko Kolarevic & Kevin Klinger, (N.Y.: Routledge, 2008) pp1-4

[21]Kas, Oosterhuis, Hyperbodies: Toward an E-motive Architecture, (Basel: Birkhaeuser, 2003)

[22]See Continuum: From the school lab to the factory workshop www.f2f-continuum.eu

CNC compatible cutting files. Prototypes were constructed with the aid of 3 axis CNC milling machines directly from parametric CAD or other digital models, CNC drilling machines, ABS 3D printers.

The appropriate use of the above presented infrastructure presuppose the development of specific competences and skills by both staff and students. Existing curricula are far from assuring such competences directing students to acquire this knowledge and capacities empirically and out of any systematic educational process. If these skills and competences are necessary for the development of the new paradigm, then it will be necessary for architectural curricula to dedicate more time and energy to assure the conditions under which the use of IT technologies and testing will be a means to an end and not an end-in-itself exercise, depriving students of the final outcome of the content and association with its original theoretical premises and architectural ideas.

(Re)searching a parametric architectural curriculum

From all the above, it becomes evident that as teachers we are all confronted with the challenge to reshape our educational environments in order to meet the demands of a fast-changing world. Even though we all recognize the need for change, in our everyday educational experiences, the key word is not so much the change itself, which in any case has framed all the recent developments of our educational system, but the speed of this change. The speed of change appears to be the central issue of our educational environment, which profoundly affects our teaching strategies and pedagogical approaches.

Even with difficulties, we certainly can adapt the architectural education we are offering so that our students will be responsive to this fast-changing world. The forms of education offered till now appear increasingly insufficient to cope with the new demands of practice, the fast growth of the variety of building materials, the implementation of new construction methods and techniques, the variable expectations of the clients, the liquidity in the financial and political dynamics in the globalised economy. It is no more possible to teach the same way we have been taught. We must restructure our curricula in order to be appropriate for an unpredictable profile of the graduate architect, since we can no more envisage the context in which our graduates will operate. We can no more apply the same educational and pedagogical strategies to students who are nowadays exposed to unpredictable, multiple stimuli, knowledge and images reaching them through the digital infrastructure available. An architectural design course can no more be taught in the same way when it takes place in a room called atelier (1950s), laboratory (1960s), design studio (1970s-80s) or lab (1990s). We cannot teach the same way we used t, people who have no free-hand sketching skills but have incredible dexterity in texting. We cannot implement the same pedagogical approaches for our students who read and write less but see and hear more…

In conclusion, architecture or design at various resolutions, in post-anthropocene times with irreversible repercussions, has to reinvent its role and responsibility. Building technology has to be redressed as a way of saving the planet as opposed to a way of added to its extinction. In times of possibilities and probabilities at quantum resolutions and nonhuman creativity design has to redesign itself to be purposeful and innovate while relevant to contemporary questions of accelerationism and cosmopolitics. New materials and updated building technologies are evolving sympathetically. Design speculates on the future and speculations design futurities. Studies on non-standard geometries that can best construct the non-standard emergent materialities, on robotics and drone development for construction, simulation techniques of structural and material behaviour, on the environmental impact of new and advanced materials, and on the speculative rehabilitation of existing buildings are some representative research topics presented in the current section.

CHAPTER #5.01

THE PARTICULAR STEREOTOMY AT THE 'OBRA NOVA' OF THE VALENCIA`S CATHEDRAL

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1. Introduction

In an era when there wasn't any book about stereotomy, it was the master stonemason Miguel Porcar, heir of the gothic constructive tradition, who started in 1563 the construction of the so called 'Obra Nova', a series of arch-curved galleries on the northwest façade of the gothic Valencia's Cathedral, using a particular stereotomy due precisely to that curved façade (Figure 1).

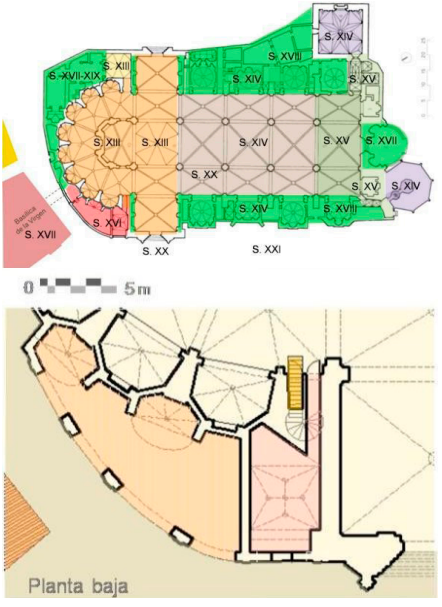


Figure 1. Up: General diagram of Valencian Cathedral along by the time. Down: Hypothesis. The construction of a sort of porch on groundfloor, made by Porcar in 1563. (Drawing by Vicente Blasco) .[1]

2. The stereotomy

The etymology of the word stereotomy broadly designates the art of cutting three dimensional solids into shapes to be assembled, although the meaning of this word is usually restricted in architecture to designate more specifically the art of stone carving for the purpose of constructing vaults, squinches, cupolas or whatever part of a building where it is required[2].
As it is known, stereotomy, used almost always for cutting stones, is the technique needed to cut stones in order to use it in construction allowing previously to determine the shape of each of its components and, therefore, to represent the constructive process through decoupling the whole volume that has to be constructed in elementary volumes, easily to handle and fit together on the work, seeking to ensure the homogeneity of the static performance of the architectural ensemble.
In other words, stereotomy is the technique that gives solutions to the geometrical problem of cutting up a constructive element filling up the space by getting ready the joint planes properly according to the tensional condition of the construction and the nature of materials[3] .

3. The treatises

The first treatises about stereotomy appeared exclusively in France and Spain in second half of 16th century. Developed from the techniques of medieval drawings, and concluded with all the contributions made all along until its appearance, stereotomy is, surely, the unique architectonic discipline without any origin in Italian treatises.

[1]BLASCO GARCÍA, Vicente. "La construcción de la Obra Nova de la Catedral de Valencia. Un ejercicio de impostación y transformaciones renacentistas en torno a la girola gótica", p.283 (up) and p.685(down) . Thesis. Valencia, September 2016.

[2]SAKAROVITCH, Joël. "Stereotomy, a multifaceted technique". Proceedings of the First International Congress on Construction History, Madrid, 20th-24th January 2003, ed. S. Huerta, Madrid: I. Juan de Herrera, SEdHC, ETSAM, A. E. Benvenuto, COAM, F. Dragados, 2003.

[3]CALVO LÓPEZ, José. "Cerramientos y trazas de montea, de Ginés Martínez de Aranda". Thesis, Madrid,1999 p.3. Volume I.

Before this period, there aren't any conclusive documents about cutting methods used by Late Medieval Period stonemasons, due to the lodges' constant secret which jealously protected that knowledge.

Up to that moment, the main sources of medieval construction science were just some personal notebooks, such as the Villard the Honecourt's notebook, a situation which would start to change in 15th century when some masters defied trade-union power, and dared to write about what was an art exclusively handmade[4].

Nevertheless, no book about stereotomy was published until far exceeded halfway through the 16th century. One of the first well-known manuscripts was Rodrigo Gil de Hontañón's, published between 1560 and 1570, a book or notebook mainly focused on walls or buttresses dimensions, the start of buttresses or proportions of towers, but not specifically on stereotomy.

When it comes to stereotomy, the first important book from this period was '*Le premier tome de l'architecture*' written by the French author Philibert de L'Orme in 1567, in which we can already find out the traces for the round dug arch as the one used at the Obra Nova in Valencia (Figure 2).

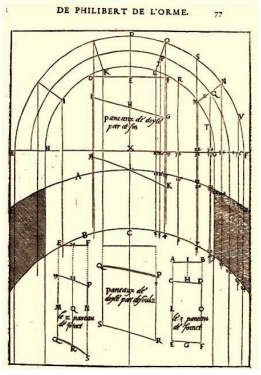


Figure 2. Round dug arch by Philibert de L´Orme, Third book from "Le premier tome de l´architecture "(1567) .[6]

But the first contribution to the subject in Spain was the handwritten '*Libro de trazas y cortes de piedras*' by Alonso de Vandelvira, written between 1575 and 1580, in which Vandelvira includes a number of examples much more considerable than de L'Orme's[5].

The importance of Vandelvira's book is due to its contribution to the study of stereotomy, in which it contemplates a systematic and global analysis of all problems about drawing arches and makes a true effort for showing the whole late mediaeval construction system using examples from Spanish stereotomic models.

For the publication date of both books, subsequent to Obra Nova, none of them could have any influence on Spanish Architecture in that period and much less on Porcar and Gregori's work.

Therefore, they didn't stand a chance of having read any book about stereotomy when both of them, Porcar and Gregori, made their work at Valencia's Cathedral in 1566, even less the work's first author, Miguel Porcar, a stonemason who couldn't write, when he started the construction in 1563.

On the contrary, there is a high degree of probability that Vandelvira took Obra Nova's round arch dug as one of the examples for his book as it would happen later in another influential manuscript about stonework with numerous drawings that appeared around the end of 16th century or the beginning of 17th's, the so called '*Cerramientos y trazas de montea*' by Ginés Martínez de Aranda (Figure 3).

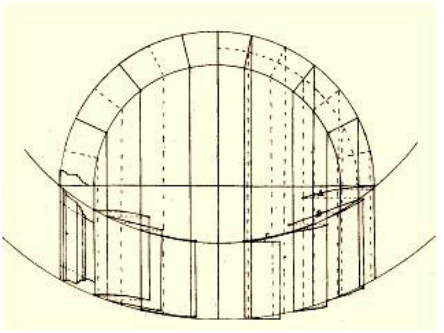
Aranda's manuscript, one of the most important contributions to the Spanish Renaissance architectonic literature, stands out, together with Vandelvira's, for its neatness, clarity and simplicity, with an extraordinary number of traces, accompanied with figures for each one of them.

Both books are interesting for our purposes because we can find out on them the drawings that explain something similar to the type of

[4]PALACIOS GONZALO, José Carlos "Trazas y cortes de cantería en el renacimiento español", Ediciones Munilla-Lería, Madrid 2003.. See the prologue, written by HERNÁNDEZ GIL.

[5]PALACIOS GONZALO, José Carlos. "Op. cit., Madrid 2003. See the prologue, written by HERNÁNDEZ GIL.

[6]DE L´ORME, Philibert. "Le premier tome de l´architecture". pp.75-77. It can be checked on: http://gallica.bnf.fr/ark:/12148/bpt6k85636g/f162.item



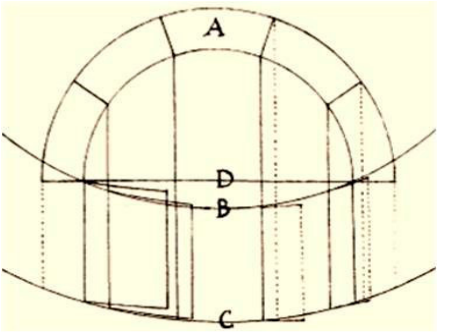


Figure 3. Left: Round dug arch, by Alonso de Vandelvira)[7]. Right: by Ginés Martínez de Aranda [8].

arch built at Obra Nova by Miguel Porcar in 1563 and lately in 1566 with the incorporation of Gaspar Gregori for the whole and final traces, those that we can see now.

4. The singular case of 'The Obra Nova'

Up to the arrival of the Renaissance to the city of Valencia, we might say that its Cathedral did not enjoy the advantages of its position as a real civic centre despite the magnificent presence of its Apostles' Door. It was in the middle of 16th century when the Chapter had the appropriate idea of building this attached element which would put the Cathedral in relation with the privileged place in which it was.

Except for very few examples in the world we could consider the 'Obra Nova' of the Valencia's Cathedral as a unique, singular and exceptional case, or at least one of the few with its features in the history of Architecture, due to conform a Renaissance gallery with the style of the Italian interior spaces, called 'cortile', but in this case forming an external space with the additional particularity, which makes it exceptional, of conforming a curved façade with arches with difficult outline and execution (Figure 4).

It is precisely that shape of the façade what raises the use of a particular type of arch, the round dug arch, a version of the dug arch by Vandelvira to which the architect Palacios González adds 'and round'[9]. This is a type of

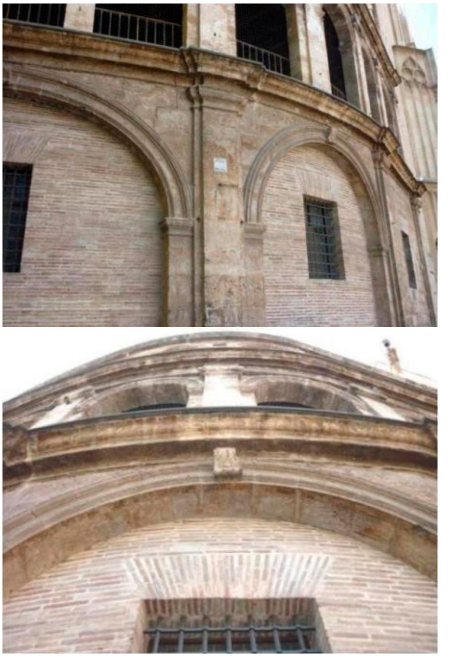


Figure 4. Round dug arches at Obra Nova. (Pictures by Vicente Blasco).

[7]Picture from CALVO LÓPEZ, José. Op. cit. Thesis, Madrid, 1999. p.106 Volume II.

[8]Picture from CALVO LÓPEZ, José. Op. cit. Thesis, Madrid, 1999. p.104 Volume II.

[9]PALACIOS GONZALO, José Carlos, p.60 "Trazas y cortes de cantería en el renacimiento español", Ediciones Munilla-Lería, Madrid 2003.

arch opened on a wall in which both faces are cylindrical, having a concave arch for the inner face and a convex one for the outer face. A type of arch that, in addition, is curiously not much used in Spanish Renaissance except for very few examples as the ones erected at the Obra Nova of Valencia's Cathedral[10], at a time, 16th century, when these arches were built by tracing the natural size of the real arches on site[11] due to its difficulties.

So, due to the huge difficulty of this type of arch, which results from the intersection of two perpendicular cylinders, it is evident that with this work Miguel Porcar left clear his skill as a stonemason as well as his knowledge about stereotomy, a very complicated one, in a period in which, as we have seen, he hadn't got any treatises or manuscripts to rely upon. From this point of view we could say that his learning and skills used to come from the practice and knowledge of his trade and from a strong constructive intuition.

For a seasoned stonemason as Porcar was, the cutting of keystones didn't present any difficulty. The added difficulty was, in the case we are studying, when those elements had to be cut for a round dug arch, using the appropriate cutting tools, which were practically the same used, without changes, from the Romanesque period to the Enlightenment (Figure 5).

5. Conclusion

Up to the arrival of the Renaissance to the city of Valencia, we might say that its Cathedral did not enjoy the advantages of its position as a real civic centre despite the magnificent presence of its Apostles' Doorway. But it was in the middle of 16th century when the Chapter had the appropriate idea of building this little attached element, called Obra Nova, which would put the Cathedral in relation with the privileged place in which it was.

At a time when there was no book about stereotomy, it was the master stonemason Miguel Porcar, heir of the gothic constructive tradition, who started the construction of these arch-curved galleries in 1563, using a type of arch opened on a wall in which both faces are cylindrical, with a concave arch on the inner face and a convex one on the outer face. This was a very complicated stereotomy, when no treatises or manuscripts to rely upon were available.

And this is the magnificence and the great contribution of Porcar's work to the history of Architecture, as cutting of blocks of stone or keystones was not that difficult, but when those had to be cut for a round dug arch, that represented an unprecedented difficulty.

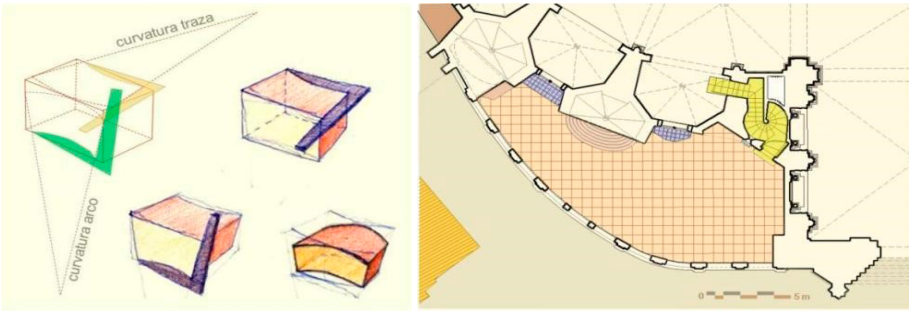


Figure 5. Left: Curvature and cutting of the keystones in round dug arches at Obra Nova. Right: The curved trace of the Obra Nova at northwest façade of Valencian Cathedral. (Drawings by Vicente Blasco)[12].

[10]CALVO LÓPEZ, José. Op. cit. Thesis, Madrid, 1999. p.103 Volume II.

[11]CALVO LÓPEZ, José, p.71 "Los trazados de cantería en la Teórica y práctica de fortificación de Cristóbal de Rojas". (Article) Proceedings of the Second National Congress on Construction History, A Coruña, 22-24 October 1998, eds. F. Bores, J. Fernández, S. Huerta, E. Rabasa, Madrid: I. Juan de Herrera, SEdHC, U. Coruña, CEHOPU, 1998, pp.67-75. It can be checked on: http://www.sedhc.es/biblioteca/actas/CNHC2_010.pdf

[12]BLASCO GARCÍA, Vicente. "La construcción de la Obra Nova de la Catedral de Valencia. Un ejercicio de impostación y transformaciones renacentistas en torno a la girola gótica", p.736 (left) and p. 653 (right). Thesis. Valencia, September 2016.

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CHAPTER #5.02

EVOLUTION IN SHELL CONCRETE STRUCTURES IN VALENCIA REGION (SPAIN)

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1. Introduction

Shell structures have very little thickness, their resistant function is especially due to their shape. They are held basically by tangential membrane forces. Their predecessors are vaults and domes wich are composed of pieces with low resistance to tensile stresses due to their discontinuity. Therefore their resistant mechanism are compression forces. A problem appears at supports where horizontal thrusts normally generate bending stresses. It must be solved by increasing the thickness of pieces. It means an increase in dead weight which is detrimental fot the structure support (Torroja, 1957). These obstacles were overcome when reinforced concrete appeared because its ability to absorb tensile stresses by steel and its monolithic behaviour with concrete. This fact led to an explosion of research and experimentation in this field. Dead weight was eliminated thanks to little thicknesses of shells, this fact made possible longer span structures due to their shape. This situation led to a real race increasing span and reducing thickness of shell cocrete structures in the 20s and 30s. The first aim was to bring the new structural typology to paroxysm, regardless of the economic argument (Fernández et al., 1999)

The history of shell concrete structures begins in Europe at the beginning of the 20th century. First manifestations are ribbed concrete thin vaults of 46 x 60 m at the hangars of Avord made in 1916 by Freyssinet. This system was improved refinedly in the hangars of Orly (1921-1923) where a 6 cm shell is folded to get more inertia, covering a span of 88 m with a parabolic guideline. José Eugenio was the first person in Spain using this structural typology in Deposit of Gijón (1902) where covered a span of 3,80 m with a 6 cm thickness shell supported by beams and pillars. Another figure in this field was Franz Dischinger, technical director of the company that patented Zeiss-Dywidag method used in Jena planetarium, built in 1926 covering a span of 40 m with a 6 cm thickness shell. Eduardo Torroja overcame the planetarium record in 1933 covering the Market of Algeciras, a span of 40,80 m, with a 9 cm thickness shell. Up to this point we have shown concrete shell structures with classical shapes (vaults and domes). First experimentations with new and revolutionary forms are made by Freyssinet in the Bagneux Workshops, with conoids making a saw-teeth roof in 1928-1929, the 5-6 cm of thickness shell used in 1929 by Bernard Lafaille to cover span of 30 to 50 m or Eduardo Torroja's Fronton at Recoletos vault and the roof of Hipódromo de la Zarzuela, both in 1935. Later but not fewer important are the Spanish architect Felix Candela's contributions. This Mexican and American nationalized architect became the most representative figure in shell structures. He experimented with reinforced concrete and double curvature shells. He used all their variants and combinations creating buildings of singular beauty and with high structural interest. The decline of this tipology came around the 60s and 70s, when the salary of building workers rose makig the building economically unsustainable. We can still enjoy great examples of this tipology after the Second World War like Pier Luigi Nervi's vaults in Turin in 1949, covering a span of 95 m or Esquilan's one in the CNIT in Paris in 1958 covering a 258 m span with only 3 supports with double folded 6 cm thickness shells with diaphragms (Fernández et al. 1999).

This paper will show some of the most important works built with this interesting structural typology in Valencian Region.

2. First shells in Valencian Region

Construction of the "*gola*" (channel) of the Perellonet in 1837 started the building of a small nucleus of barracks next to the gateskeeper's house. The settlement grew during the 1920s because the construction of the Nazaret-Oliva highway. II Marquis of Valterra promoted the construction of social housing in the place because unhealthy living conditions in Perellonet after the Civil War. The architect Carlos de Miguel decided to use the CTESIPHON (Rabasco, 2011) vault system for this nucleus of 27 dwellings built between 1950 and 1952 (Figure 1). This system take its name from an arc in Ctesiphon palace at ancient Persia and it was introduced in Spain because the lack of building materials, especially wood and steel, in the 1950s by Rafael García de la Hoz in a promotion of social housing in Palma del Río (Cordoba). For its execution a sackcloth fabric is laid over parallel formworks with a head down catenary shape and covered with a doubled layer cement mortar. The fabric, because the weight of the mortar, is deformed giving the vault its characteristic wavy shape. This geometric peculiarity gives the vault high rigidity.

Figure 1. Current picture of the house.

Carlos García designed two types of dwellings, both with a parabolic, 6m span section. A building with 9 m length, forms a 3 bedrooms and 54 m² dwelling (Figure 2) and another 7 m long building a 2 bedrooms and 42 m² built house (De Miguel, 1953). The houses are laid in linear blocks which delimit the streets of the nucleus. The vault have bay windows and door (Figure 1). The village is completed with a chapel built with the same system. Unfortunately

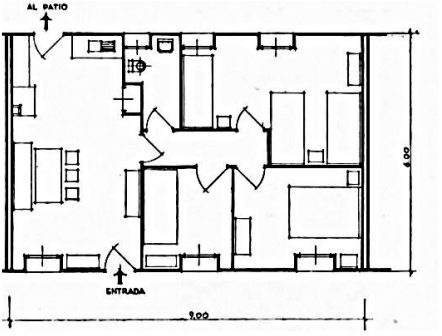
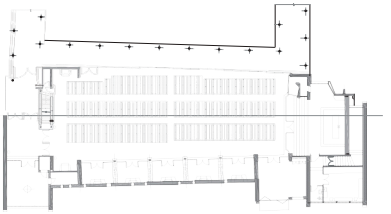


Figure 2. Floor plan of the house.

the village has suffered several reforms and extensions with traditional building methods which threaten its original character.

One of the most published shell structures in Valencian Region is the Church of San Nicolás de Gandia, designed by the renowned Civil Engineer Eduardo Torroja Miret (1899-1961) and finalised after his dead. This Project was carried out in collaboration with Architect Gonzalo Echegaray and Engineer Jaime Nadal (Torroja, 1962). The Church is located at the end of port of Grau de Gandia. The group, built between 1958 and 1962, is formed by the Church, the Abadía House and the gardened cloister that joins both with the bell tower. The main nave of the Church has a trapezoidal shape (Figure 3 left) and its dimensions are 33 x 10-12 m with a height of 13.5 m in all its extension including the apse, giving the volume rotundity and visibility (Jordá, 2002).

The structure is formed by two concrete-wall 15 cm thick beams which rest on the main façade and the apse wall covering a27 m span (Fernández et al., 1999). Both concrete shells acquire inertia as they are bent in Z shape. This fact is achieved by adding the roof of the nave and the side chapels in the South and the cloister in the North. The significant torsional stresses caused by the Z geometry are absorbed by reinforced concrete ribs which reinforce the slab, by the outter side on the south slab and in the inner one the north slab. This reinforced concrete ribs also support the cantilevered roof slab, transmitting loads to both sides wall beams. Active stresses were introduced into



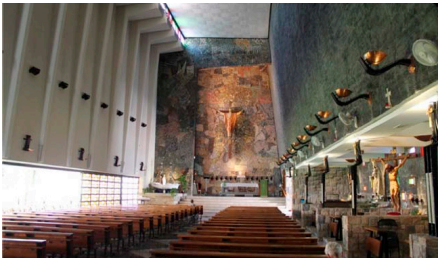


Figure 3. Floor plan and interior view of the Church.

the slabs by post-tensioning in such a way the wall beams are tensioned only to compression stresses. The independence of the slabs allows a continuous skylight which illuminates the central nave and the side aisles (Figure 3 right).

Another building of the first period is the Workshops rooftop of the Industrial Master's School (IES Politecnic nowadays) in the city of Castellón de la Plana, commissioned in 1963 by the National Education Ministry to architect Luis M. Feduchi. The structure consists of 6 rectangular umbrellas of 9 m x 13.50 m., consisting each one in 4 parabolic hyperboloids, 7.5 cm thickness shell resting in a single central 40 x 40 cm support, that houses the downpipe in its core. The umbrellas, aligned three to three, are inclined forming a saw-teeth roof, leaving an 1.5 m height opening, providing propper sunlight to the workshops according to their use (Figure 4). In the original project, the brick perimeter walls didn't reach the roof, leaving a continuos window that showed the structure from the interior, keeping it hide from the street (Martínez-Feduchi, 1973).

Figure 4. Interior view of the original builiding

The shells constructor was the company, Construcciones Laminares, S.L. Its founders Ricardo Urgoiti and José Ruiz-Castillo learned to design, calculate and execute this type of structures with Felix Candela. This architect is a main figure in the development of reinforced concrete shell structures.

The school was demolished and rebuilt in 2001. The workshops walls were demolished keeping the structure alone so that it can be perceived in all its splendor (Figure 5).

Figure 5. Exterior view of the renovated building.

3. The decades of the 70s and 80s

"La Cúpula" restaurant is part of Eurhostal tourist complex, located in Las Fuentes estate, placed at Alcossebre (Lamela, 1972). It was designed by Antonio Lamela Martínez (Madrid, 1926-2017), an architect graduated in 1954 in Madrid, where he established his studio. He is the author of numerous and important works around the world including the towers of Colón (1974), the remodeling of the Santiago Bernabeu Stadium

Figure 6. Exterior and interior views of the restaurant.

(1988) and, in partnership with Richard Rogers, the T4 at Barajas Airport (2006). "la Cúpula" restaurant (Arnau et al., 2011), built between 1972 and 1973, has a roof made up of 8 hyperbolic-paraboloids sections supported by triangular and inclined concrete shells. It covers a span of 24 m and it is 5.35 m height at the key. Shell is reinforced at its free edges of the shell. (Figure 6).

One of the most interesting works made with folded plates is the Church of Santa María del Mar by the architect Agustín Gabriel López, born in Extremadura Region. Built between 1987 and 1991, it was conceived as an opened-air church for liturgical celebrations in the summer months (Gabriel, 1987). Its structure is formed by reinforced concrete frames, with increasing sectionsupports, arranged radially starting from the presbytery. Originally it had a perimeter wall that did not reach the roof leaving the nave opened. Soon after, it was closed with stained glass windows. The church of Santa María is covered by a 10 cm thick folded plate making a pitched roof leant on a reinforced concrete frame structure, with a maximum span between supports of 17,40 m. A 20 m high cross crowns the apse outside the church. The floor is arranged as an amphitheater around the apse with stepped levels in order to see the altar (Figure 7). The last bay at the right of the apse is extended, including the roof, covering the rectory and a modern bulrush of small dimensions.

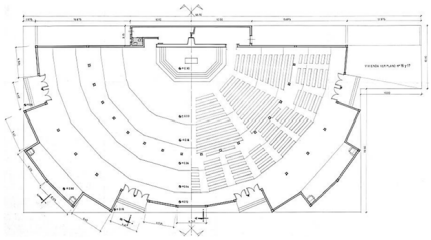


Figure 7. Floor plan and interior view of Santa Maria's church in Gandia.

4. The last shells

The Oceanogràfic Park of Valencia is part of the City ofArts and Sciences of Valencia. The origin of the City was in 1989, and took shape in 1991 with a project by Santiago Calatrava. After a long stop of works and important modifications the Oceanogràfic Park was added to the complex. It is the largest oceanographic park in Europe with 110,000 m² and 42,000 liters of water. The access building and the restaurant are the most structurally interesting buildings of the Park and two of the most spectacular shell structures of the Valencian Region, designed at the begining by Felix Candela. After the death of Candela, the access building was developed by the Madrid engineer Carlos Fernández Casado S.L. (Fernández et al. 2000) and the restaurant by the engineers Alberto Domingo and Carlos Lázaro.

The roof of the access building is formed by 3 lobes of hyperbolic-paraboloids (Figure 8). It has a total width of 34 m, distance between opposite supports of 30 m and height in the key of 11 m and of 21 m on the edge. The hyperbolic-paraboloids are sectioned by two vertical planes passing through their center and a curved surface forming their free edge (Sanchis, 2013). Unlike Candela's roofs, the 12 cm of thickness shell has a double steel reinforcement, and the supports are articulated.

The Restaurant roof is formed by 8 lobes, 4 hyperbolic-paraboloids arranged concentrically (Figure 9). The distance between opposite supports is 35.5 m and the height of 8m in the key and 12.27 m on the edge. The top of the free edges projects out 6.83 m. (Sanchis, 2013). The cover is inspired by the restaurant Los Manantiales in Xochimilco (Mexico), by Félix Candela (1957).

The white concrete, reinforced with steel fibers, was shotcreted over the steel reinforcement (Domingo et al., 1999). The 6 cm thick shell, is armed with a steel layer, which is superfluous because the fibers, and is reinforced in nerves and key. The supports are considered articulated.

Figure 8. Cover of the access building under construction.

Figure 9. Restaurant Cover.

5. Conclusions

The reinforced concrete shell are a very interesting structural typology. In the Valencian Region are placed works built by the most important shell designers like the acces and restaurant building in Oceanogràfic Park by Felix Candela, and the Church of San Nicolás in Gandía by Eduardo Torroja. In this Region this structural typology had its period of maximum splendor in the 60s of the 20th century. Although there are works from later years, like the 70s to 90s, the increase or the workers salary reduced its presence and make private promotion practically disappears. The evolution in the construction of this type of structures goes through the change of wooden forms by other metal and adjustable in height ones. Ricardo Urgoiti and José Ruiz-Castillo used a mobile metal formwork in the 60s in order to execute structures more quickly. Another advance is using steel fibers to reinforce concrete instead a steel layer, at least in calculations, as Carlos Lázaro and Alberto Domingo proved in the restaurant of the Oceanogràfic Park.

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CHAPTER #5.03

USAGE OF BAMBOO POWDER AS AN ADDITIVE IN ADOBE BRICKS AND BAMBOO CANES FRAME FOR THE REINFORCEMENT OF ADOBE STRUCTURE

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1. Introduction

1.1. Raw earth architectures

Every expression of vernacular architecture is able to gather and witness traditional techniques of construction from any time. During the centuries, these traditions achieve high levels of adaptation to the context, with solutions of considerable interest from a structural, bioclimatic, economic and environmental point of view. Among them, earth construction plays a leading role, as demonstrated by its high adaptability. In fact, they spread for thousands of years throughout the world in areas with very different environmental and social contexts. Many construction techniques rely on the use of raw earth. The best known, are adobe and rammed earth (called also *pisé* or *tapia*). Techniques based on earth and straw, are spread worldwide; for example the wattle and daub, or methods based on earth and wood, like the cob wall constructions (bague or freemason). In Latin America those techniques (called *quincha, bahareque, embarrado, cuje*..) use the bamboo as one of the main construction material. In this paper we refer to the technique of adobe. It consists of sun-dried bricks made of a mixture of clay, water and organic fibers, pressed into an open timber frame. Adobe buildings are widespread in Latin America and the Middle Eastern countries, but also in the Mediterranean Area. The main characteristic of adobe is to have high compression resistance, but no tension resistance. Therefore, one of the most critical points of adobe buildings, and in general of earthen structures, concerns their seismic behavior. In case of horizontal loads of a certain severity, the walls tend to crumble. This material, often considered as modest and brittle, has been regularly replaced by materials considered modern and safer. Nevertheless, understanding and analyzing the criticalities of raw earth should be the challenge to improve both materials and techniques, in order to design innovative solutions.

1.2. The research on bamboo as a constructing material

The properties of this material are botanical, anatomical, physical and mechanical. It grows in different climates and many species are also invasive; moreover, it is easy to be employed in any construction: lightweight to carry and it has an optimal tensile strength. The plant grows under the ground with a complex root system that forms a single body with the stems that protrude from the ground. The cutting of the culms is controlled and does not involve the death of the plants that every year regenerate, in contrast with what happens with trees. Despite its peculiarities, the bamboo is often known as the "poor man's timber", the symbol of the precariousness in which the most disadvantaged populations live. The research analyzes the possibility of increasing the tension resistance of earth bricks, by using bamboo powder from the waste of industrial processing as additive in the mixture of adobe. The use of bamboo is also hypothesized as an external reinforcement and a prototype structure, that uses bamboo as additives in the adobe mix and as external reinforcement. The research designed an external frame of bamboo to be applied to the existing and new adobe walls, which is able to provide support in case of earthquake. The research analyzes the possibility of delaying the collapse of the structures of adobe using bamboo as a completion.

2. Uniaxial compression tests on adobe with bamboo powder additive

2.1. Materials and methods

The bamboo species used in research is the Angustifolia Kunth, a type of giant bamboo that grows in several parts of the world at temperate latitudes. Angustifolia Kunth is endemic of Latin America, where it is called Guadua and where is one of the most common species used in the construction industry. The powder we employed, passed through a sieve of diameter φ = 4.75 mm, it is a waste of production from a Colombian company that produces furniture and structural elements in the building industry. For the tests, they were prepared 27 specimens of adobe with bamboo powder addictive from the "bamboo burr". The specimens are 8 × 8 × 8 cm. The tests conduced on specimens without any additive and with 20% of water of the weight of earth, and the tests from Gigliotti & Malara (2012). These tests were performed in the laboratory of Materials and Structures Testing of DIDA (Unifi). For the realization of the specimens, it was employed earth dried in oven at 60 °C for about 24 hours, minced with mechanical grinder and passed through a sieve of diameter φ = 4.75 mm (corresponding to ASTM sieve n°4). The sieve n°4 was also employed to sift the bamboo powder. The earth was kneaded with bamboo powder in proportions equal to 3%, 8% and 12% of the weight of the earth, and mixed with water at 30% and 40%. The mixture was manually processed and pressed into a timber mold, and removed after 2-3 days of drying. Thereafter the specimens were seasoned with air on a wooden panel for about a month. This process of slow drying reduces the possibility of cracking. The performed tests in monoaxial compression, were conducted in stress-controlled mode; the force is increased at a given rate and the correspondent piston's displacement is measured. The test specimen are loaded with a rounded head on a thick plate positioned on the upper surface of the specimen. The data on the displacements of the specimen along the direction parallel to the load were recorded through four displacement transducers placed on the four corners of the load plate.

Specimen	N.	Water Percentage	Additive	Additive %content*
I020	9	20%	None	0%
B330	9	30%	Bamboo powder	3%
B840	9	40%	Bamboo powder	8%
B1240	9	40%	Bamboo powder	12%
TGC**	5	19%	Calcined gypsum	15%

* dry weight percentage.

** Gigliotti & Malara, 2012

Table 1. Test specimens.

Property	Symbol	Value
Specific Weight	Gs	2.4707 gr/cm3
Water Content	W	15.65%
Liquid Limit	Ll	23.09%
Plastic Limit	Lp	19.57%

Table 2. Test specimens.

Specimen	Additive	σr [N/mm²]
I020	none	2.07
B330	3%	3.54
B830	8%	3.97
B1240	12%	4.61
TGC	Other*	2.4

* 19% of calcined Gypsum from Gigliotti & Malara (2012).

Table 3. Comparison of the tensions of failure for adobe specimens.

Specimen	%
B330	70
B840	91
B1240	122
TGC*	15

* 19% of calcined Gypsum from Gigliotti & Malara (2012).

Table 4. The percentages of resistance's increase compared to resistance of the specimens without additive.

2.2. Tests

2.2.1. Preliminary analysis on the raw earth

To study earthen structures is necessary to investigate both the issues related to the soil mechanic and of the strength of materials. In order to hypothesize the shrinkage and the behavior during the tests. The earth used for the research is from an excavation about 4 meters deep in an area close to the little village of Guane, Barichara, Santander Department, Colombia. (Table 2)

2.2.2. Results

The tests on specimens with bamboo powder as additive, show different increases of the tension of failure σr respect to the values obtained by the specimens without any additive. Depending on the quantity of additive in the mixture. The test results are proposed in Table 3.

2.3. Conclusions

The use of bamboo powder as well as the calcined gypsum additive increases the compressive strength of the adobe. Heighten the quantity of additive there is an increase of the compression resistance; it is recorded according to the data presented in the following chart. (Table 4)

Bamboo powder is a material recycled from the waste of the industrial processing. Therefore, the use of such additive is an ecological solution and does not affect the final cost of the adobe bricks. Other than not affecting and reducing production costs, using this waste material allows you to enter a recycling and reuse process, thus sustainable.

3. Bamboo frame for the reinforcement of adobe walls

The research also tested the effectiveness of bamboo external frame for adobe walls, to install on existing and new structures. A grid of orthogonal bamboo canes, tied together by means of vegetal ropes, forms the designed reinforcement. The frames, juxtaposed on both sides of the adobe wall are anchored each other by transversal elements, in order to form an external cage that stands on independent foundations. In normal conditions, the bamboo

grid does not collaborate with the bamboo wall, but the frame is activated in case of earthquake, avoiding the risk of crumble of the wall; in fact, the elastic bamboo grid dissipates the seismic energy. The reason why the reinforcement is installed on both sides of the wall is that the seismic force can have different directions. Nevertheless, the tests were performed considering the presence of the frame on only one side of the wall. In fact, the aim of these tests is to evaluate the resistance of the canes and the lashed connections under the wall's self weight on the most loaded side. If the wall were loaded on the opposite side, the second grid would be activated. The tests were performed considering that the two structures are independently anchored to the ground.

3.1. Materials and methods

Laboratory tests were done on the adobe panel, on the bamboo frame and on the adobe wall reinforced with the frame. These structures were tested in horizontal position. The tests performed are static tests, that do not intended to quantify the failure resistance of the structure, but only to assess the collaboration of the two materials in the situation in which the adobe panel is subjected to out of plane stresses. The line of interaction of the load is perpendicular to the rows of bricks. The load was applied manually with the consecutive addition of weights of 5 kg each. The distributed load, perpendicular to the surface of the wall, is positioned along the central part of the same on a metal bar of 4 cm in width. The surface of the metal bar on the panel side was coated with polyethylene to adapt to the surface irregularities of the adobe wall. The measuring apparatus consists of graduated rulers integrated in the wall. A fixed horizontal line, constituted by a nylon wire hold in tension between the two supports, is the parameter on which is measured the vertical displacement of the specimen at the point of application of the load.

3.2. Adobe Wall

In order to perform the tests, they were made by hand 1200 bricks of dimensions 10 × 10 × 2,5 cm (scale 1:4). This procedure of production is analogous to the one described in the paragraph 2.1. For the realization of the bricks, no additives were used in the mixture. The bricks were afterwards assembled in scaled walls (scale 1:4) of dimensions 60 × 60 × 10 cm. The bricks are disposed in rows of 6 elements, fixed with mortar of sieved earth ASTM 10 (φ = 2.00 mm), mixed with water in proportion of 2.5 liters of water every 7 kg of earth. After a few days, the formwork is disassembled, and the wall seasoned for a month.

3.3. Bamboo Frame

The bamboo used is Phyllostachys viridiglaucescens, an Italian species that grows in Camaiore, Lucca. The preservative treatment is with the method of vertical diffusion for transpiration of the foliage, using a solution of borax and boric acid. The mechanical characterization of the bamboo culms is in Table 5.

Property	Unit	N. of specim. tested	Value
Diameter min	mm	/	46.0
Diameter max	mm	/	67.0
Thickness min	mm	/	4.1
Thickness max	mm	/	7.2
Area min	mm^2	/	578.2
Area max	mm^2	/	1347.0
MC	% (dev.st.)	12	24.9 (5.8)
σc	MPa(dev.st.)	12	56.8 (7.6)
Ec	MPa(dev.st.)	12	3100 (520)
σt	MPa(dev.st.)	4	159.0 (13.0)
Et	MPa(dev.st.)	4	22500 (8000)

* Mechanical characterization of bamboo culms carried out by Fabiani, M. (2014).

Table 5. Characterization of the culms of Phyllostachys viridiglaucescens.*

Since the guadua culms used for structural uses in Colombia have diameters between 8 and 12 cm, a scaled diameter comprised beetween 2 and 3 cm was chosen. The canes were chosen with less imperfections. The length of the canes is about 1 m. The bamboo structure consists of 4 horizontal and 4 vertical canes joined together at 90 degrees angles. The spacing between the canes is about 19 cm, which corresponds to a real spacing of 75-80 cm (scale model 1:4). The lashing are made following the traditional technique of lashing with ropes (uniones amarradas in Hidalgo López, 1980). In particular, the square lashing, optimal for joining two perpendicular elements was chosen. This type of joint, as it is completely external to the culm, avoids to drill the bamboo fiber; it is simple to perform, and is realized with readily available on-site materials. The analysis of the mechanical behavior of the lashes showed that it has a static behavior similar to that of a hinge. The resistance of this type of unions is linked to the mechanical characteristics of the material used for lashings. The rope used is the Cabuya, a processed product extracted from the fibers of Furcraea Andean plant, traditionally used in the Eje cafetero region (Colombia). The tension of failure in traction was measured of the order of about σr = 54 Mpa.

3.4. Tests on the flexural test on the adobe panel reinforced with bamboo frame

The adobe walls were loaded until their collapse, that happened with an ultimate load of Fu = 220 kg. The test results are shown in the load – displacement (σ-ε) diagram (Figure 1).

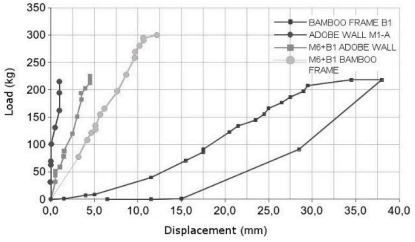

Figure 1. Load displacement diagram results.

The bamboo frame was not brought to its breakpoint, as the available instrumentation for the test was not able to apply an adequate load until the failure. The tests demonstrate how bamboo is able to withstand, without damage, to loads that determine the collapse of the adobe structure. Besides, once removed the load, the structure goes back to its initial configuration with minimum deformation left. Concluding, the results verified that the presence of the bamboo frame improves the stability of the adobe panel, if the panel exceeds the tension of failure. The bamboo structure under normal conditions of use does not cooperate with the adobe wall, but it is triggered in caseof horizontal loads, avoiding the collapse of the wall (Figure 2).

3.5. Conclusions

Figure 2 shows the load-displacement diagram results. Here, is possible to do a direct comparison among the bending tests of the different solutions (the adobe wall, the bamboo frame and composed structure). The adobe panel and the bamboo frame have a very different behavior. On one side, the adobe wall has not yield point and reaches abruptly the collapse (see test M1, Figure 2), on the other side, the bamboo tends to significantly deform. The specimen B1 in Figure 2 is an example of the above described behavior. Despite the different behavior of the two materials under loading, they have performed a good collaboration. As exhibited by the test specimen M6-B1 in Figure 2, the tests on the reinforced adobe wall demonstrated the ability of the bamboo frame to support the adobe panel, and prevent its collapse. When the adobe structure exceeds the tension of failure and fails, the adjacent bamboo frame prevents the crumbling of the already damaged parts. The comparison of the test specimens with and without reinforcement evidences the efficiency of the proposed solution, as shown in Figure 2.

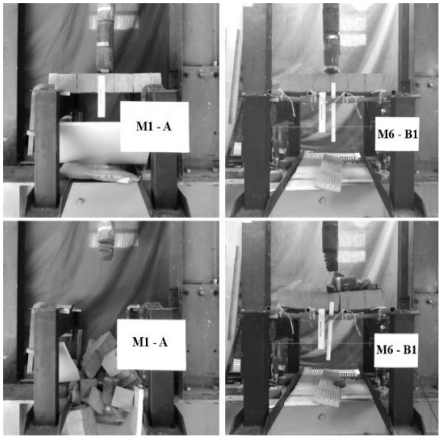

Figure 2. Comparison between de unreinforced wall (M1) and the wall reinforced with the bamboo frame (M6-B1).

4. Conclusions

The research has demonstrated the ability to increase the resistance of the adobe structures using various products from bamboo cane. Bamboo powder is a waste of industrial processing. Produced in large quantities, it can be used as additive in the mixture for adobe bricks. In small weight percentage (3% of weight of the used earth) the tested specimens' compressive strength increases up to 20%. Bamboo cane frames are external reinforcement in new and existing adobe structures. In presence of several horizontal stresses that could cause the collapse of the adobe structure, the bamboo frame is crucial to prevent the collapse. In addiction, the great flexibility of the element in bamboo absorbs seismic energy incident on the structure by reducing a further increasing of deformation of the adjacent adobe wall. The advantages of the use of such products are several. Among them, the bamboo is able to increase the resistance of existing and new construction to prevent their collapse in case of exceptional events. Nevertheless it is a renewable resource.

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CHAPTER #5.04

THE CROSS LAMINATED TIMBER AS AN ENERGETIC ALTERNATIVE IN LOW STRUCTURAL ENERGY SYSTEMS

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1. Introduction

In recent years there has been a huge increase in CO2 emissions into the atmosphere exceeding the limits established in the Kyoto Protocol. For its part, the building sector involves a high percentage of total CO2 emissions into the atmosphere (Yeheyis et al., 2013). According to the European research project Potential for Environmental Improvement of Residential Buildings (IMPRO-Building) (Nemry, F. et al., 2008), 60% the consumption of primary energy and between 70-80% of environmental impacts correspond to the products of housing, transport and food and drink.

Currently, the world's energy efficiency in converting primary energy into useful energy is approximately one third. (Anderson D. et al., 2000).

During the next 20 years, the amount of primary energy needed for certain level of energy services could be reduced profitably by 25-35% in industrialized countries. Furthermore, current investagtions estimate that the energy demanded will increase by forty percent in that period of time, mainly in developed countries. (Policies for the future 2012).

Sustainability requires efficiency in the processes. In the specific case of building, embedded energy and CO2 emissions into the atmosphere will be the regulatory parameters of environmental sustainability, as clear indicators of level of the building's efficiency.

There seems to be a generalized emphasis on the energy efficiency of the buildings once the building process is completed, without taking into account that the construction process represents an important percentage of the total life cycle of the building. It seems logical to make an exhaustive measurement of these emissions, and the energy certification not only refers to the period of use, but to the complete life cycle of the building (Mercader 2012).

2. Materials and metodology

2.1. Selection of housing samples used

The aim of this article consists in the comparative quantification of the structural efficiency of the contralaminated timber as compared with structural systems in reinforced concrete and structural steel, in terms of energy consumption and generation of CO2 emissions, only the structure and enclosures chapters (Monahan & Powell 2011). The periods of the life cycle studied are the construction phase of the building and the phase of use during the useful life period.

2.1.1. Model 1- Single family home

The first housing model is an isolated detached house. Rectangular shape and developed on two floors, ground and first, with a floor area of 207m2. The exact location is 39 ° 31'23.51 "N and 0 ° 29'35.94" W.

2.1.2. Model 2- housing block between party walls

The second sample is a residential building between party walls, establishing a closed block. Trapezoidal plan develops on the ground floor and five upper floors. All of them include two houses per floor, the last being the recess of the facade to make an attic. Constructed surface of 1340m2. The exact location is 39 ° 27'29.57 "N and 0 ° 20'6.83" W.

2.2. The methodology used

From the two previous samples and on which the whole experimental plan of this section

will be developed, the structure according to the Eurocodes will be calculated, until strictly fulfilling the requirements established in the current regulations. In the case of cross-laminated timber, the European Technical Suitability Document of the company KLH massivholz GMBH has been used.

Subsequently, the energy calculation of the extraction, fabrication, assembly and commissioning phase of the materials composing the structure and enclosures of the building has been carried out, by measuring the masses of theconstituent elements of the two systems. Each mass will be assigned embedded energy values and CO2 emissions equivalent depending on the material used. For the calculation of the energy embedded in the elements, the database of the data bank BEDEC (ITEC, 2015) of the Construction Technology Institute of Catalonia was used, calculating the energy in MJ/Kg of each construction element.

Since the laminated timber composes both the structure and the enclosure of the building, in the energy evaluation of the two conventional systems compared, reinforced concrete and structural steel, parameters of conventional enclosure with double ceramic brick wall and internal insulation have been assigned for the last two, with identical thickness and internal insulating material, to establish a credible comparison.

In the section of energy evaluation in the period of use, the parameters mentioned above have also been taken into account. To carry out this calculation, the two samples have been evaluated by CERMA computer program (CERMA, 2017).

As initial considerations to homogenize the results and allow their comparison has been considered the same thickness of enclosure for the set of solutions. Identical thermal insulating materials have been selected in all the solutions with the same thicknesses to homogenize the proposals. The holes of the envelope with identical characteristics have been considered to equal the response of the systems. And finally, the same heating, cooling and DHW systems have been projected for the three hypotheses.

2.2.1. Structural Analisys

To perform the structural analysis, the geometry of the structure, the actions and the supporting conditions have been modeled by the model generated and suitably validated, capable of adequately reproducing the structural behavior. The modeling was carried out using ANGLE software (Alonso, 2017). The structural analysis will be linear, since in all three cases, the material used has the characteristic of linearity of deformations against actions, in the elastic limit.

2.2.2. Sink effect and net CO2 emissions

Once the energy evaluation has been completed in the two study stages, the evaluation of the potential of global warming is carried out through the net balance of CO2 emissions into the atmosphere.

Unlike the two conventional systems, where the process of recycling and production results in a huge energy consumption, in the case of cross-laminated timber, we should take into account the sink effect and consider wood as an agent that sequesters CO2 while it was tree. Indeed, almost all the energy that the tree needs to grow up is given, for free, by the sun.

According to the National Forest Inventory II, it is possible to obtain CO2 sequestration by the Spanish forests of 1,8556 Kg CO2 / Kg always in coniferous wood, which is the one used in the cross-laminated timber boards.

A coefficient is applied to the primary energy demanded according to the following table, whose values have been collected from the recognized document Emission Factors of CO2 and coefficients to primary energy of different final energy sources consumed in the buildings sector in Spain (Ministry of Industry, Energy and Tourism, 2014).

3. Discussion

For the primary energy impact category, the following figures the demand of each period are shown. The cross-laminated timber obtains smaller energetic demands.

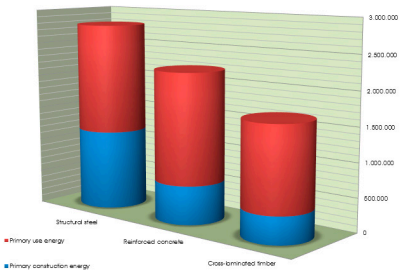


Figure 1. Consumption of primary energy in sample 1 according to construction system (MJ).

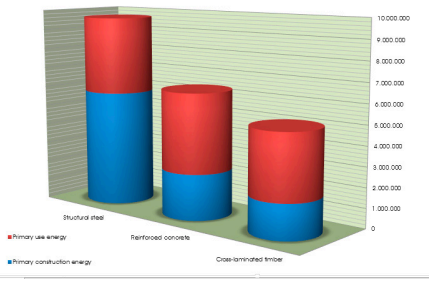


Figure 2. Consumption of primary energy in sample 2 according to construction system (MJ).

The first relevant result is the importance of the construction period in the global primary energy, representing in the case of the sample 1 between 24% and 25% for the cross-laminated timber and reinforced concrete, while the construction in structural steel supposes 42% of the total. This value matches with the results of the Improbuilding project.

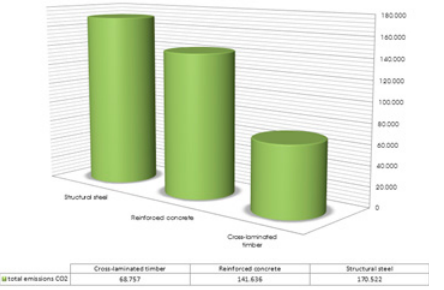
For sample 2, the situation is worse for steel, representing only the construction, 60% of the total and even exceeding the period of use. In contrast, cross-laminated timber and concrete represent 35% and 37% respectively.

In global values of primary energy demand, including the two evaluation periods, the cross-laminated timber offers, for sample 1, an energy saving of 25% and 41% for reinforced concrete and steel respectively, while for sample 2, it is 20% and 48% respectively.

As regards the Global Warming Potential, as can be seen in the following figures, we have a reduction that goes, in sample 1, from 51% of the savings in emissions compared to the reinforced concrete structure, reaching 60% for structural steel.

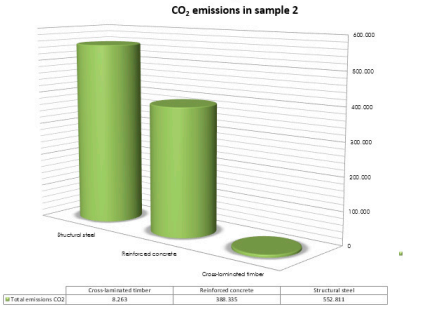
In the case of sample 2, the saving in emissions is much higher, reaching rates of 97% for reinforced concrete and 98% of saving compared to structural steel.

This last set of results are really revealing, since, if a saving in the carbon footprint, for single-family homes, between 50-60% is a great advance in terms of emissions, in the case of residential buildings, where the structural system in cross-laminated timber is massive reaches values of



	Cross-laminated timber	Reinforced concrete	Structural steel
total emissions CO2	68.757	141.636	170.522

Figure 3. CO2 emissions in sample 1 according to construction system (Kg).



	Cross-laminated timber	Reinforced concrete	Structural steel
Total emissions CO2	8.263	388.335	552.811

Figure 4. CO2 emissions in sample 2 according to construction system (Kg).

97-98%. Considering this aspect, together with the sink effect of the wood, they generate a benefit in carbon footprint that practically annuls the rest of the global emissions generated by the building.

4. Conclusions

Efficiency, as a nec–essary objective in any decision-making process, takes on a key value when we speak of an issue as important as the sustainability of planet Earth.

1._ In the two impact categories studied, a greater efficiency of the cross-laminated timber has been demonstrated with regard to conventional systems with reinforced concrete structure and structural steel, for the construction of single-family homes and residential buildings between party walls.

2._ In the period of construction of the building, the demand for primary energy represents between 24% and 35% depending on the sample used, of the total energy demanded, in the case of cross-laminated timber. In the case of concrete, it amounts to 25% and 37% respectively, while structural steel increases by 42% and 60%.

3._ The demand of primary energy that generates the structure and the enclosures with cross-laminated timber in the periods of construction and use of the building produces a saving of between 20% and 48%, with respect to concrete and steel.

4._ With regard to the global warming potential, the use of cross-laminated timber produces significant savings, in the two samples used. Thus, in the case of sample 1, the savings in emissions ranges between 51% to 60%, in relation to reinforced concrete and structural steel respectively. For sample 2, the savings reach values of 97% and 98% in emissions. This aspect is really revealing, since we can affirm that using cross-laminated timber in residential buildings annuls the set of global CO2 emissions.

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CHAPTER #5.05

LIFE CYCLE ASSESSMENT AS A PROJECT DECISION-MAKING TOOL

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1. Introduction

Nowadays, there is evidence that supports the existence of global warming (Cox, Betts, Jones, Spall, & Totterdell, 2000). This situation is making society become increasingly aware of the imminent danger that global warming may cause (Thomas et al., 2004). This change in attitude can not only be observed in the general population but also in new international and even regional laws, norms and regulations. All of them reflect this change in mentality with a common main objective: to avoid the occurrence of global warming or if not possible, to reduce drastically its effects.

Every industry field is undergoing deep change in their production process in order to succeed in making the least damaging products they can. We can consider the construction industry to be especially sensitive in this matter due to the enormous amounts of raw materials required to perform any activity in such a field (González-Vallejo, Marrero, & Solís-Guzmán, 2015). The search for ecological materials becomes crucial in meeting this necessity (Cabeza, Rincón, Vilariño, Pérez, & Castell, 2014).

But how much does a specific material impact the environment? In order to answer this question, it is necessary to analyze all the processes involved in the life cycle of each particular material from the moment the manufacturing is started until the end of life of the resulting product. This methodology is known as the Life Cycle Assessment (LCA) defined in the international ISO 14040, 2006 norm (International Organization for Standardization, 2006). Making use of this methodology we can calculate the environmental impacts of any product, service or activity divided in different categories such as CO2 emissions, abiotic depletion, fresh water eutrophication and many more.

Therefore, knowing the impacts over the environment of a particular material it is possible to take environmentally-oriented decisions in a project. Considering the huge importance that different environmental certifications are getting in today's society it might not only be a conscious decision but a good business decision as well. In this particular case, the LCA methodology was used to influence over the decision of the typology used for the façade of a building in construction. The façade originally projected to be used had a layer of precast concrete and a layer of mineral wool on the inside. The alternative proposed to the previous one was a compound of different layers consisting of plasterboard and sandwich panels. An LCA was performed with the purpose of knowing if the proposed façade had a smaller impact over the environment than the original one. Through this study all the processes of the production of the materials are taken into account as well as the impacts generated by the final disposal of those materials. The impacts are assessed by using the information provided by databases referred in subsequent sections. As it would be seen in the following sections, conducting a Life Cycle Assessment allows architects and other technicians in taking environmentally aware decisions, helped by actual reliable data, when projecting a building.

2. Methodology

2.1. Functional unit

The functional unit considered in this study is 1m2 of façade, each one of them having different thicknesses. This difference in volume between the two solutions is not considered to be relevant because they accomplish the same task as building envelope regardless of their thickness. Their layers are depicted in Figure 1.

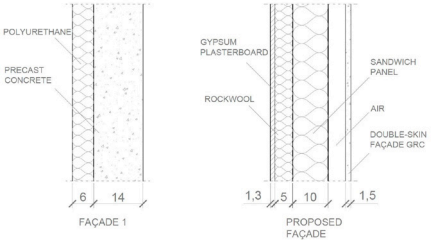

Figure 1. Cross section of the typologies.

2.2. Inventory Analysis

An Inventory analysis based on the model described in the subsequent sections has been performed following the framework provided by the ISO (International Organization for Standardization, 2006). The objective of an inventory analysis is to account for every activity, raw material and process that can impact the environment. For that purpose, reliable data has been collected to describe the mentioned model. The specific data used for this study is provided by Ecoinvent (Ecoinvent, 2018). Ecoinvent is a not-for-profit association that started by the Domain of the Swiss Federal Institutes of Technology. With more than twenty years of experience, its purpose is to collect reliable data on the environmental impacts produced by the different industrial sectors. The tool used to model the Life Cycle Inventory is the software Simapro 8.3.0.0, the last version of one of the most popular software programs used for LCA calculations. In relation to the geographical representativeness, the energy and production data used is adapted to the Spanish market. The adaptation is made by using the data about the Spanish electricity consumption provided by Ecoinvent. In Figures 2 and 3 the networks created to calculate the impacts are depicted. The networks represent the impacts of each one of the manufacturing processes.

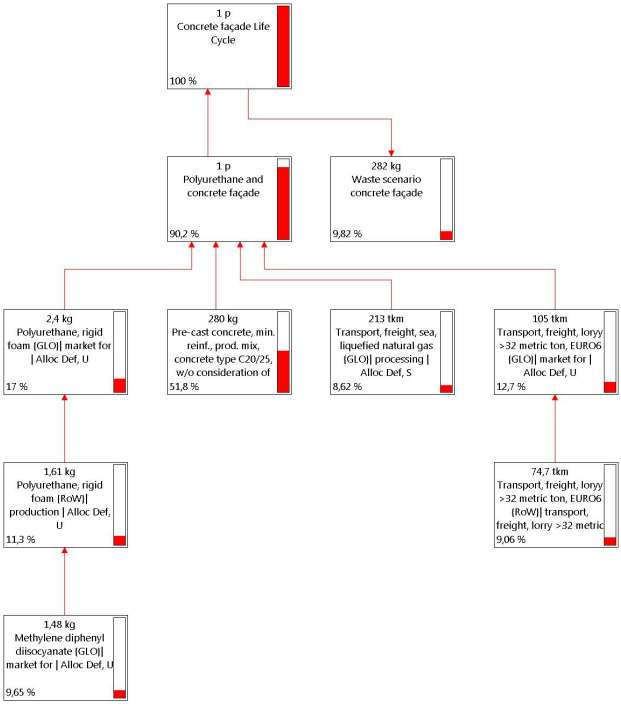

Figure 2. Network of the concrete façade.

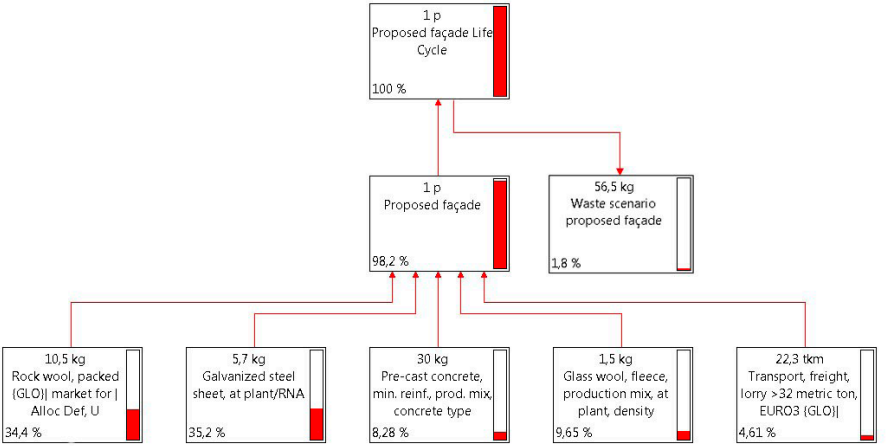

Figure 3. Network of the proposed façade.

3. Results

The Life Cycle Assessment has been performed using different methods for the study to be more reliable. Every method has different ways of computing data; therefore, the results may vary depending on the study. Among all the available methods for performing the life cycle assessment, two of them are selected: The IPCC. GWP 100a ("IPCC - Intergovernmental Panel on Climate Change," n.d.) was used for calculating the greenhouse gas emissions (equivalent CO2 Kg) emitted by each material separately and the Recipe Endpoint method (National Institute for Public Health and the Environment. Ministry of Health, 2011). The latter is intended to replace the two most important methods up to this point, the Eco-Indicator99 and the CML 2002 combining the mid-point approach and the end-point approach in a harmonic way (European Commission - Joint Research Centre - Institute for Environment and Sustainability, 2010).

3.1. IPCC GWP 100a

Figure 4 shows the comparison between the Kg of equivalent CO2 emitted by 1m2 of material. Using this method, we can account specifically for the impacts that affect climate change.

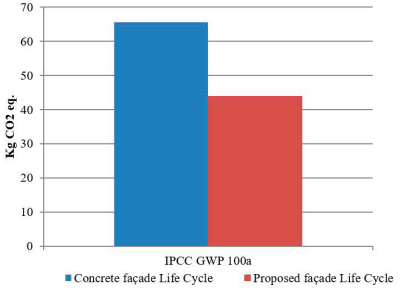

Figure 4. Comparative assessment of the two façades using GWP 100a.

3.2. Recipe Endpoint

Using the Recipe Endpoint method, we obtain the impact over the environment caused by the material divided into several impact categories. This being a comparative study, the categories are expressed as a percentage comparing one façade solution against the other. The different impact results are expressed in Table 1. In order to summarize better the results obtained using this method, the categories can be merged into three main ones: human health, ecosystems and resources. Figure 5 shows the differences between the emissions concerning each one of these three main categories.

Impact categories	Concrete façade Life Cycle	Proposed façade Life Cycle
Climate change Human Health	100	67.0697
Ozone depletion	100	65.777
Human toxicity	94.8804	100
Photochemical oxidant formation	100	94.9619
Particulate matter formation	51.5281	100
Ionising radiation	100	99.0655
Climate change Ecosystems	100	67.0706
Terrestrial acidification	22.5057	100
Freshwater eutrophication	51.0831	100
Terrestrial ecotoxicity	100	53.4002
Freshwater ecotoxicity	94.0498	100
Marine ecotoxicity	100	88.3861
Agricultural land occupation	15.1872	100
Urban land occupation	100	41.2138
Natural land transformation	-100	70.0663
Metal depletion	100	55.7256
Fossil depletion	100	71.385

Table 1. Recipe Endpoint Characterization.

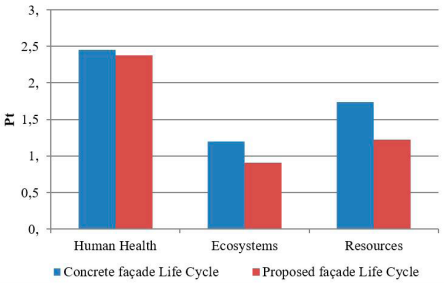

Figure 5. Comparative assessment of the two façades using Recipe Endpoint.

4. Conclusions

Observing the Greenhouse gas emissions calculated using the GWP IPCC method, a 33% reduction is shown. In the case of the Recipe Endpoint Method, the difference on Human Health is only of around a 3 %, in Ecosystems a 24% and in Resources a 30%.

After analyzing the results obtained by the Life Cycle Assessment of the two typologies several conclusions can be drawn:

- It is possible to reduce the impact over the environment of a building just by analyzing properly the impacts the materials used have in their Life Cycle.
- Tools like these can be useful for professionals who are concerned with taking environmentally-aware decisions.

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CHAPTER #5.06

STUDY OF THE POTENTIAL FOR COST-EFFECTIVE ENERGY SAVINGS IN THE PUBLIC SCHOOL SECTOR IN VALENCIA THROUGH THE OPTIMAL COST METHODOLOGY

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1. Introduction

EU establishes that it is the responsibility of Member States to set minimum energy performance requirements for buildings and building elements. The requirements must be set with the goal of achieving cost-optimal levels (EU, 2012).
For this, a common methodology was established by EU in which, in addition to the intervention costs, all costs related to the building and its energy consumption are considered. Through the optimal cost method, it is possible to determine the intervention level in the building in which, with the lowest global cost, obtains the greatest energy savings.
This methodology has been applied to 14 public schools of Valencia, which had previously been characterized and identified as representatives of all the group of schools of the city. In this way, the results obtained for each one can be extrapolated to all of the schools they represent. This article includes the application of the cost-optimal method of one of these schools, specifically type de "C1-I" which identifies buildings built between 1940 and 1960 with a low thermal compactness.

2. Methodology

Optimal cost methodology can be applied in different ways. In our study, we will follow the system developed by the Valencian Building Institute (IVE) that was used in other energy studies, mainly in residential buildings such as De la Fuente (2015). The steps in the application of the method would be:

- Characterization of the building to be studied and determination of energy rehabilitation measures to be implemented by levels.
- Estimation of energy requirements and emissions to be considered at the different levels.
- Calculation of global costs of the five levels of improvement established and global cost of maintaining the building in its initial state
- Application of the financial formula, obtaining results and preparing the optimum cost graphs through a grade 2 polynomial trend line.

2.1. Building characterization, improvement levels and energy study

The first step in the energy study of the school has been the collection of data in three areas: general data (date of construction, heating area, climatic zone, etc.); data on energy requirements (the envelope, transmittances and surfaces of the different building elements: roofs, facades, carpentries, floors in contact with the ground, etc.) and data on the installations (types of heating and domestic hot water (DHW) systems, power, air conditioning installation, etc.). On the basis of this data, an information document on the initial state has been drawn up (Figure 1).
The second step has been to establish intervention levels according to energy saving objectives to be achieved, the degree of action to be taken, the regulatory requirements, etc.
In this study five improvement levels have been proposed. These levels are defined, firstly, by the regulatory requirements in energy efficiency, in particular, whether the requirements of 2006 CTE, 2013/17 CTE apply or if the objective is to obtain a NZEB. Secondly, depending on if the intervention is only in the envelope (facades, roofs and holes) or also on the facilities (heating and electricity). In this way, the improvement levels would be: N1, envelope according to the CTE 2006; N2, enclosure according 2006 CTE

Energetic characteristics | **Type: C1-I**

|School C1-I | Date 1937-59 | Mediterranean climate|

Original state

A. Characteristics: building elements and systems

Element	Description	U (W/m²K)
Roof (Q1)	Ceramic tile (TJC) Ceramic board (TBC) Horizontal air chamber (CH-D) False cane ceiling (CZZ) Plastering (ENL)	4.17
Facades (F1)	Plastering of cement (ENF-C) 550mm brick wall (MF55) Plastering (ENL)	0.85
Windows (V) and doors (HP)	Wood Simple glass	2.2 5.7

System	Description
Heating system	Electric radiator / Power 1500w 3 radiators / classroom and 1 radiator / office
DHW-Domestic hot water	Electric thermo-accumulator in kitchen

B. Other information

General data

Law: Before NBE-CT-79
Building type: Full building
Use: Intensity: media-8h
Climatic zone: B3 / IV

Built area: 828.959m²
Useful area: 699.31 m²
Heating area: 574.06m²
Heating volume: 2043.63 m³
Height: 3.56 m
Nº of floors:1

Envelope areas

Area Q1: 574.06 m²
Area F1: 407.29 m²
Area V (NW, NE): 45.05 m²
Area V (SW, SE): 50.40 m²
Area HP (NW): 10.55 m²
Area HP (SW): 10.55 m²

Figure 1. School type C1-I.Building characteristics: original state. By the authors of this paper.

and facilities; N3, envelope according to 2013/17 CTE; N4, envelope according to 2013/17 CTE and facilities; N5 envelope and facilities to obtain a NZEB.

The description of the proposed improvement measures and the transmittance levels achieved are included in a list of improvement proposals (Figure 2). This file also includes the results of the school's energy study (original and improved state), along with some graphs that facilitate its interpretation and analysis.

An energy analysis leading to a real intervention would require a deep energy audit and real measurements. The theoretical and indicative nature of our study, and the lack of data and technical means to perform measurements or other tests, has led us to make an energy qualification or certification of the buildings using the Ce3X program as a tool.

2.2. Global cost calculation

Global cost includes all costs related to the intervention, consumption and building maintenance during calculated period. These costs are: initial investment cost (CI), both in the thermal envelope of the building and in equipment and systems; replacement cost; disposal cost; annual energy cost; annual increase in the price of energy; annual maintenance cost and residual value of existing elements and systems.

Calculation period (T) is set in Delegated Regulation No. 244/2012 of the European Union, which for public and residential buildings is 30 years. The initial investment cost has been calculated for each level of improvement. It is equivalent to the Contract Budget (CB), that is, the material execution budget (MEB) plus general expenses (6%) and industrial profit (13%). It also includes technicians' fees (10%) and taxes. For its calculation, the Construction

Improvement levels

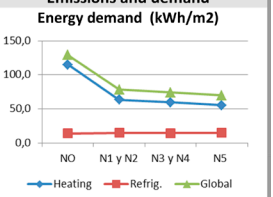
A. Characteristics: building elements and systems

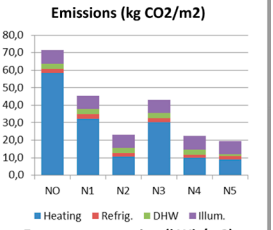
Element	Description	U (W/m²K)
Roof (MQ1l)	TJC + TBC + CH-D *	
	Plaster false roof with thermal insulation**:	
	- CTE 2006 (N1-N2): MW e= 60 mm λ=0.034	0,45
	- CTE 2013 (N3-N4): MW e= 100 mm λ=0.034	0.29
	- NZEB(N5): XPS e= 140mm λ=0.028	0.19
Facade (MF1l)	ENF-C + MF55 +ENL*	
	Plasterboard with thermal insulation**:	
	- CTE 2006: MW e= 40 mm λ=0.035	0.59
	- CTE 2013: MW e= 50 mm λ=0.032	0.36
	- NZEB: MW e= 100mm λ=0.032	0.23
Windows and doors	Wood	1.43/1.3
	PVC	2.3/1.3
	Double glass**:	
	- CTE 2006: 4+6+4 (N)	3.3
	- CTE 2013 : 4+6+4 (BE) /4+10+4 (BE)	2.7 / 2
	- NZEB: 4+10+4 (BE) / 4+12+6 (BE)	2 / 1.3

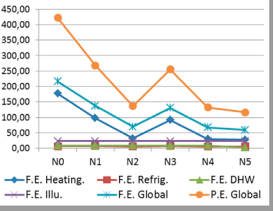
Sistema	Descripción
Heating system	Split
DHW- Domestic hot water	Electric thermo-accumulator in kitchen

B. Graphics

Emissions and demand







C. Energetic analysis results: improvement levels

Results C1-I	N0		N1			N2			N3			N4			N5		
Heating demand	115,0	G	63,6	44,7%	F	63,6	44,7%	F	59,4	48,4%	F	59,4	48,4%	F	55,1	52,1%	E
Refrigeration demand	13,9	C	14,9	-7,5%	C	14,9	-7,5%	C	14,6	-5,3%	C	14,6	-5,3%	C	14,7	-6,4%	C
Global demand	**128,9**	**-**	**78,5**	**37,2%**	**-**	**78,5**	**37,2%**	**-**	**74,0**	**43,1%**	**-**	**74,0**	**43,1%**		**69,8**	**45,7%**	**-**
Heating emissions	58,5	G	32,4	44,7%	F	10,6	82,0%	C	30,2	48,4%	F	9,9	83,2%	B	9,1	84,4%	B
Refrigeration emissions	2,3	B	2,5	-7,5%	B	2,0	14,7%	B	2,4	-5,3%	B	1,9	16,4%	B	1,9	15,5%	B
DHW emissions	2,9	G	2,9	0,0%	G	2,9	0,0%	G	2,9	0,0%	G	2,9	0,0%	G	0,9	70,0%	E
Illumination emissions	7,7	B	7,7	0,0%	B	7,7	0,0%	B	7,7	0,0%	B	7,7	0,0%	B	7,7	0,0%	B
Global emissions	**71,5**	**F**	**45,5**	**36,4%**	**D**	**23,1**	**67,6%**	**B**	**43,3**	**39,5%**	**D**	**22,4**	**68,7%**	**B**	**19,7**	**72,5%**	**B**

Energy consumption C1-I	N0	N1		N2		N3		N4		N5	
Final energy- heating	176,85	97,80	44,7%	31,91	82,0%	91,33	48,4%	29,80	83,2%	27,64	84,4%
Final energy - refrigeration	6,88	7,40	-7,5%	5,91	14,7%	7,29	-5,3%	5,79	16,4%	5,85	15,5%
Final energy - DHW	8,74	8,74	0,0%	8,74	0,0%	8,74	0,0%	8,74	0,0%	2,62	70,0%
Final energy - Illumination	23,33	23,33	0,0%	23,33	0,0%	23,33	0,0%	23,33	0,0%	23,33	0,0%
Global final energy	**215,91**	**137,32**	**36,4%**	**69,89**	**67,6%**	**130,70**	**39,5%**	**67,66**	**68,7%**	**59,44**	**72,5%**
Global primary energy	**421,80**	**268,32**	**36,4%**	**136,57**	**67,6%**	**255,38**	**39,5%**	**132,22**	**68,7%**	**116,15**	**72,5%**
Clasification- primary energy	G	E		B		E		C		B	

Tables of demands, emissions, consumption per levels, percentages of savings respect original state (N0) and energy classification letter obtained per level and concept:

* Original state (n0), see Figure 1
**Insulation and glass types according to requirements of each improvement level
***Improvement levels: N0- initial ; N1- CTE 2006 Env; N2– CTE 2006 Env + Syst; N3- CTE 2017 Env; N4– CTE 2017 Env + Syst.t; N5- NZEB (Env_ Envelope; SYST_Systems)

Figure 2. School type C1-I. Improvement levels: by the authors of this paper.

Database IVE 2016 and CYPE price generator was used. The MEB includes disposal costs.
Replacement costs have been taken into account in those systems or equipment whose usefulness is less than the calculated period (30 years), which will have to be replaced at the end. Replacement cost is 25% less than the initial cost of the equipment or system, as a result of technology evolution and taking into account price development. This cost is also added to MEB.
Useful life of the different measures included in our study are: interior isolation, 40 years; installations (boiler, solar thermal, heat pump...) 20 years; and windows and doors 35 years. For the calculation of the overall cost of the initial state, no initial investment cost has been taken into account given that no measure is applied. Energy cost is the average annual cost considering a 30 years period. Maintenance cost is the average annual maintenance cost is also considering a 30 years period. It is calculated applying a few percentages on the contract budget, in our case: 0% in the initial state (N0); 0.5% in the levels where only the envelope was improved (N1 and N3), 2% in the levels where the envelope and facilities are improved (N2 and N4) and 4% in the level where an NZEB is sought (N5).

2.3. Application of the optimal cost methodology in the case study

Once all the costs that influence at global cost have been defined, firstly, have been calculated the MEB of the improvements at each level. Applying the percentages of general expenses and industrial profit, the contracting budgets (CP) have been obtained.
Secondly, the global costs of these improvements have been calculated, taking into account the considerations and percentages included in the previous section. Some tables developed by the IVE have been used and adapted to the studied building. With them, the average annual cost of energy and the annual maintenance cost for each level of improvement have been calculated. Figure 3 shows, by way of example, a global cost calculation table, which includes all of the partial costs that comprise it.

			Costs	
Initial investment cost	Profesional services (Architects, engineers...)		22.513,44 €	267.459,66 €
	Material execution budget		225.134,39 €	
	Taxes		19.811,83 €	
Annual cost	Energy cost	Consumption	5.385,62 €	5.385,62 €
		Sale		
	Operating cost	Cyclical regulatory cost		
		Public services (except energy)		
		Taxes		
		Others		
	Maintenance cost	Building elements		3.873,47 €
		Systems		
Maintenance				2,00%
Useful area				574,06
Residual value of the improvements		SATE		43.337,46 €
		Roof insulation		
		Indoor insulation	9.867,69 €	
		Windows	12.355,58 €	
		DHW		
		Split	30.963,88 €	
		Energy solar thermalsystem		
Global cost				501.894,90 €
Global cost /m2				874,29 €

Figure 3. School type C1-I. Global cost, level N4 of improvements: by the authors of this paper.

Optimal cost – global costs and savings

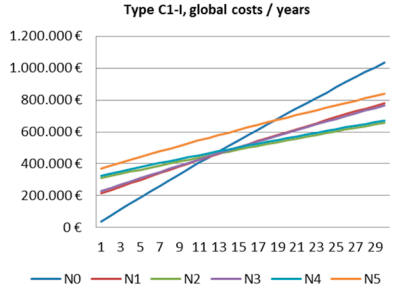
A. Costs and savings of the different improvement proposals

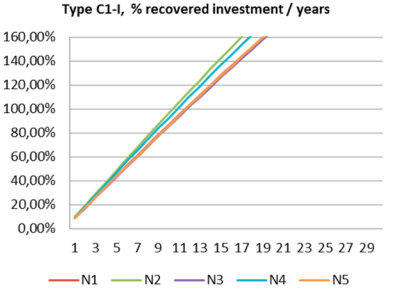
Level	Emissions reduction per year (kg CO2)			Primary energy savings per year (kWh)			Economic savings per year in energy			Amortiz. (years)
	per m2	total	in 30 years	per m2	total	in 30 years	per m2	total	in 30 years	
N0	-	-	-	-	-	-	- €	- €	- €	-
N1	26,00	14.925,56	447.766,80	153,48	88.106,73	2.643.201,86	19,85 €	11.395,36 €	341.860,92 €	14
N2	48,40	27.784,50	833.535,12	285,23	163.739,13	4.912.174,01	34,11 €	19.581,31 €	587.439,44 €	13
N3	28,20	16.188,49	485.654,76	166,42	95.535,07	2.866.051,96	21,24 €	12.194,76 €	365.842,91 €	14
N4	49,10	28.186,35	845.590,38	289,58	166.236,29	4.987.088,84	34,58 €	19.852,24 €	595.567,08 €	13
N5	51,80	29.736,31	892.089,24	305,65	175.461,44	5.263.843,17	36,32 €	20.850,88 €	625.526,34 €	15

Results: demand, emissions, consumption and improvement costs per year.

Level	Annual demand (kWh)		Primary energy consumption (kWh)		Annual emissions (kg CO2)		Initial investment		Annual global cost	
	per m2	total	per m2	total	per m2	total	per m2	total	per m2	in 30 years
N0	128,90	73.996,33	421,80	242.138,51	71,50	41.045,29	- €	- €	1.318,91 €	757.135,73 €
N1	78,50	45.063,71	268,32	154.031,78	45,50	26.119,73	284,23 €	163.164,03 €	1.003,39 €	576.003,41 €
N2	78,50	45.063,71	136,57	78.399,37	23,10	13.260,79	448,99 €	257.749,85 €	850,62 €	488.309,62 €
N3	74,00	42.480,44	255,38	146.603,44	43,30	24.856,80	301,14 €	172.873,84 €	976,76 €	560.720,65 €
N4	74,00	42.480,44	132,22	75.902,21	22,40	12.858,94	465,91 €	267.459,66 €	874,29 €	501.894,90 €
N5	69,80	40.069,39	116,15	66.677,07	19,70	11.308,98	547,66 €	314.390,49 €	1.229,52 €	705.817,10 €

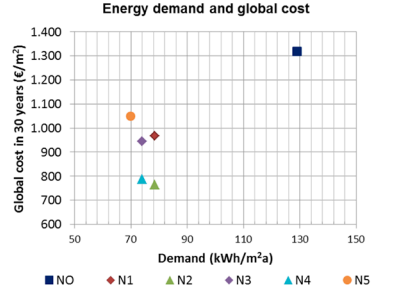
Results: Emission and energy savings per year and in 30 years.

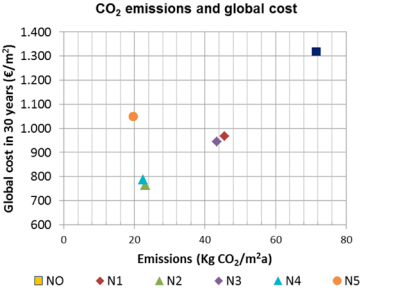




Graphic of global costs over 30 years and percentage of investment recovered thanks to savings in primary energy.

Graphics: improvement levels and optimal cost





Graphics of global costs by improvement levels, demand and / or emissions results and optimal cost curve.

*Levels: N0- initial ; N1- CTE 2006 Env; N2– CTE 2006 Env + Syst; N3- CTE 2017 Env; N4– CTE 2017 Env + Syst.t; N5- NZEB (Env_ Envelope; SYST_Systems)

Figure 4. School type C1-I .Optimal cost, global costs and savings: by the authors of this paper.

Once global costs results have been obtained by levels, a set of tables has been drawn up with the total consumption and savings, initial investment, global cost, economic saving in primary energy and amortization time of initial investment (Figure 4).
Amortization time was obtained calculating the moment when the account of savings in primary energy generated each year is equal to the initial investment. For a better understanding, a graph has been drawn up with the percentage of investment recovered per year. Amortization time for each level improvement coincides with the year in which 100% is reached.
In order to determine with what intervention level a greater energy saving is achieved at a lower cost, graphs have been drawn up with the overall costs for each improvement level and the resulting requirements and emissions (Figure 4).
In the case of this theoretical study, the optimal intervention cost would be the N2 level: intervening in the facilities and in the envelope according to the requirements of 2006 CTE, that establishes a minimum thermal U-values for the façade and roof . In this level, the global cost in 30 years will be 488.309 euros, the initial investment 257.749 euros that would be amortized in 13 year, thanks to the energy saved.
In the same way of this result it is level N4 which, with a bit more initial investment and higher energetic exigencies, obtain similar savings.

3. Conclusions

The energy retrofit of public buildings, especially schools, supposes an important energy and economic saving. By applying the optimal cost methodology to representative schools of a group, we managed to identify which is the most efficient strategy in order to achieve the greatest savings on the area and it is possible to determine the equilibrium point between energy efficiency and the cost of the intervention.
With this methodology we can know the exact moment when we are going to recover the investment and invested all the saved money in improving other schools or solve other educational necessities.

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CHAPTER #5.07

MATHEMATICAL MODELLING AND EXPERIMENTAL VERIFICATION OF THE THERMAL INSULATION PROPERTIES OF COATING SOLUTIONS. APPLICATIONS FOR BUILDINGS

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1. Introduction

Since the end of the 20th century, different strategies have been researched in order to reduce energy consumption in both residential and equipment buildings, which in some cases, can exceed 30% of the annual electrical production (Acosta, González, Zamarreño, & Álvarez, 2016; Gul & Patidar, 2015). One of the top factors which condition the energy consumption is the energy consumed to reach the thermal comfort situation in the building interiors, which depend on local weather conditions as well as additional aspects which can significantly determine the energy requirements in the buildings object of this paper. (Forgiarini R., Giraldo V., & Lamberts, 2015).

At present, the comfort in building interiors is predominantly obtained by the implementation of active strategies, independently of the geographical location of the analysed buildings. In cold regions, heating systems provide the heat required to reach the comfort temperatures, whereas in hot regions, the air conditioning (AC) systems are used to cool the spaces. In both cases, the final objective of the installations is to maintain the air temperature in the study zone as close as possible to the comfort temperature for their inhabitants.

On the other hand, passive strategies such as the use of plant roofing, paint type thermal insulation coatings or solar protection on the window structures aim to maintain the internal temperature of the buildings as close as possible to the comfort values, which aim to minimize the primary energy consumption by the building's installations. Among all the passive strategies which may be used in buildings, the thermal insulation coatings are the ones which possess the greatest versatility, since they can be directly applied on the building surfaces without the need to modify them, substantially improving the insulation in roofs and wall enclosures and accordingly contributes to reduce the final energy consumption of the building.

At the request of the Manufacturer Company, this paper analyses a thermal insulation coating. The aim of this paper is to verify its characteristics and coefficients of heat transfer and its efficiency as thermal insulation. In order to fulfil the article's objectives, it was organised as follows: Chapter 2 presents the mathematical model used; Chapter 3 explains the characteristics of the experiment and its methodology; Chapter 4 features the results in the simulation and the experimental results for a set of compiled data; finally, Chapter 5 presents several conclusions based on the analysis of the obtained da

2. Mathematical Model

The accuracy of the mathematical models and simulators is a decisive factor when analysing the behaviour of a thermal zone and the strategies which make it possible to control its internal temperature. Consequently in the research on the functioning of the thermal insulation coatings, it is necessary to guarantee the mathematical model which permits the accurate analysis of the internal temperature and the surface temperatures in the walls of the thermal zone. For this reason, the decision was made to use the grouped parameters model extensively described in the literature (Harish & Kumar, 2016a, 2016b; Satyavada & Baldi, 2016; Underwood & Yik, 2004).

With the grouped parameters method, the behaviour of a thermal zone can be represented by analogy with an electrical circuit; where the heat flow is assimilated to the electric current, and the temperature difference between the interior and the exterior is assimilated to the electric potential difference. Figure 1(a) shows the equivalent to a thermal zone with a parallelepiped shape, where the separation between the interior and exterior takes place by means of its six faces. In this model, each one of its faces is represented with an impedance Z_i with i=1,2…6. In the same way, each branch is analysed as an independent Resistance-Capacitance circuit, such as the one presented in Figure 1(b), where the sub-index j is additionally used to represent the resistance of the surface to the heat transfer processes: in is used for the resistance by convection and the radiation between the internal air and the internal surface, mid for the conduction through the surface and finally ex for the convection and radiation between the external surface and the air in the exterior.

Equation 1 is obtained from the sum of the heat flows contributed by each surface, while equations 2 and 3 permit the calculation of the surface temperatures of the internal and external face, C_r represents the thermal capacity of the air in the analysed zone, and the condensers C_(i,in) and C_(i,ex) are used equal to half of the total capacitance of the walls (Lin, Middelkoop, & Barooah, 2013).

$$C_r \frac{dT}{dt} = \sum_{i=1}^{6} \frac{T_{i,in} - T}{R_{i,in}} \quad (1)$$

$$C_{i,ex} \frac{dT_{i,ex}}{dt} = \frac{T_i}{R_{i,ex}} - T_{i,ex}\left(\frac{1}{R_{i,ex}} + \frac{1}{R_{i,mid}}\right) + \frac{T_{i,in}}{R_{i,mid}} \quad (2)$$

$$C_{i,in} \frac{dT_{i,in}}{dt} = \frac{T_{i,ex}}{R_{i,mid}} - T_{i,in}\left(\frac{1}{R_{i,mid}} + \frac{1}{R_{i,in}}\right) + \frac{T}{R_{i,in}} \quad (3)$$

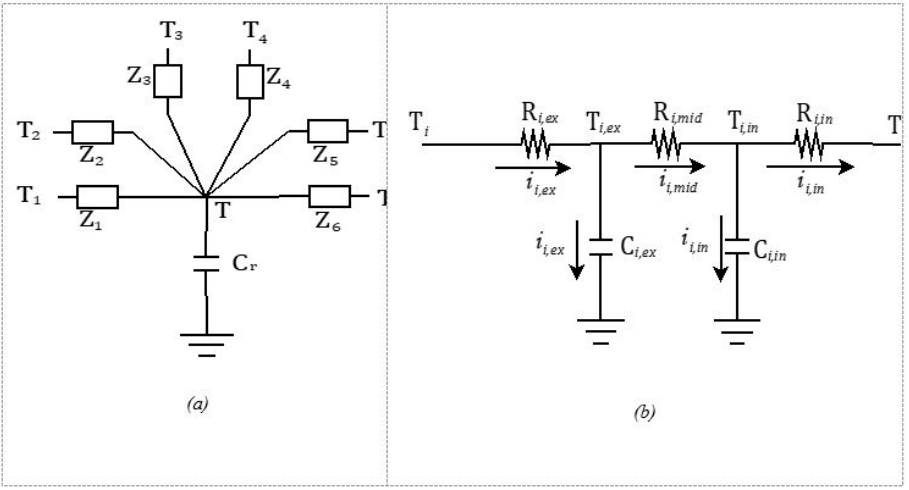


Figure 1. Representation of a thermal zone. Source: Own Preparation.

3. Methodology

In order to analyse the impact of the thermal insulation coating on the air temperature contained in the modelled thermal zone, we decided to use physical models at a reduced scale, which simulate the thermal zones which may be defined in the buildings' study, which in turn, permit us to analyse the temperature variations when their contour conditions are modified by the activation of a heat source in the interior of the thermal zone. This type of approach allows the simultaneous monitoring of various physical models, modifying the material conditions of each one on their enclosure and in this way, preventing environmental interferences during the data collection phase. The strategy consists in analysing three closed thermal zones inside of which a heat source has been installed. The three physical models which represent the thermal zones are identical in relation to their geometry and material, however the thermal insulation coating shall only be applied on two of them. In the first physical model, the thermal insulation coating has been applied on their internal faces, while in the second physical model, the coating has been applied on their external faces; leaving the third physical model with the characteristics of its enclosure intact. In this way, the variations in the thermal characteristics are easy to assess, by comparison with the model which has not been modified (Mlakar & Strancar, 2013).

The thermal insulation coating selected to carry out the experimental tests is manufactured by the G-Cover company, with the commercial name of Thermo Sköld. Its technical specifications file can be queried in the following internet link (http://www.g-cover.mx/specsheet/PROD-THERMO_ES_MASTER.pdf).

The physical models used for this assessment are three agglomerate wooden boxes with a thickness of 19 mm, with a parallelepiped shape with exterior dimensions of 0.50x0.60x0.70cm, raised 20 cm from the ground. Each one of the physical models is equipped with a 60W internal infrared lamp, and temperature and humidity sensor: Data Logger Wöhler CDL 210 such as the one shown in Figure 2. In addition, a Data Logger room was installed outside of the physical models to measure the temperature of the site in which the tests were carried out.

The first tests were carried out in a controlled interior environment, where an infrared lamp was activated and deactivated during different periods with the aim to produce a heat flow through the walls of the physical model. For identification purposes of the cycles, the period in which the lamp was lit was called the charge phase, while the period in which the light was shut-off was called the discharge phase.

Figure 2. Physical models at scale and the Data Logger for the data collection. Source: own preparation.

4. Parameter adjustments and simulation

In order to implement a mathematical model which accurately represents the internal temperature dynamic, it is necessary to calculate the heat transfer coefficients between the air and the surfaces of the physical model, which means, it is necessary to calculate the convection, radiation and conduction coefficients which govern the mathematical model.

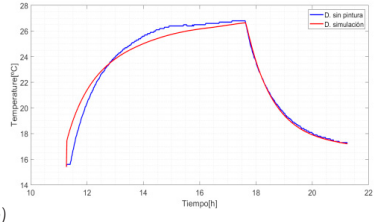
The system's dynamic significantly changes with the activation or deactivation of the infrared lamp laid out in the interior of the physical model, hence it was decided to analyse the charge and discharge phases separately. It was also decided to particularize the convection and radiation coefficients independently for the interior and exterior faces of the model so that the parameter adjustments permit a more accurate representation of the real dynamic of the physical model.

To determine the four parameters (Interior and exterior convection, Interior and exterior radiation), several functions of the MATLAB global optimization toolbox were tested, however in the end, the results o the PatternSearch algorithm were used for their quickness and accuracy. The objective function for the optimization algorithm was the mean squared error shown in equation 4. This expression was used to assess the error between the internal temperature of the mathematical simulator model and the experimental measurements taken on the physical models.

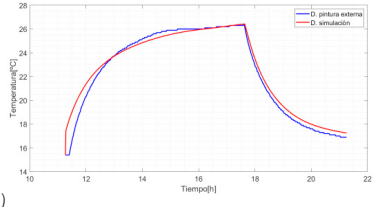
$$RMSE = \sqrt{\frac{\sum_1^n (T_{experimental} - T_{simulacion})^2}{n}} \quad (4)$$

Figure 3(a) shows the results of the adjusted mathematical simulator model and the experimental data of the physical model without the coating. A relative error of 2.7% was observed, hence the mathematical simulator model is considered sufficiently accurate to represent the dynamic of the studied physical models.

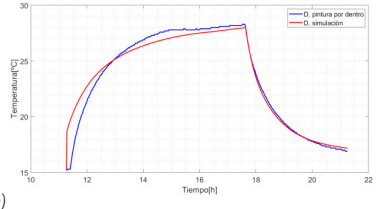
Figures 3(b) and 3(c) present the results of the mathematical model in the simulation and the experiment data of the physical models with the coating applied on their exterior and interior surfaces. In each one of the cases, respective errors of 2.8% and 3.5% were obtained. With these values, it was concluded that the additional coating layer applied on the surfaces of the physical model may affect the heat transfer coefficients between the air and the surface, however it has a minimal influence on the conduction of the case's surfaces.



3(a)



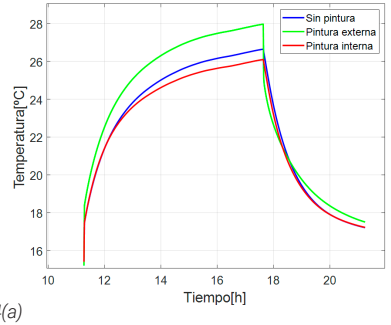
3(b)



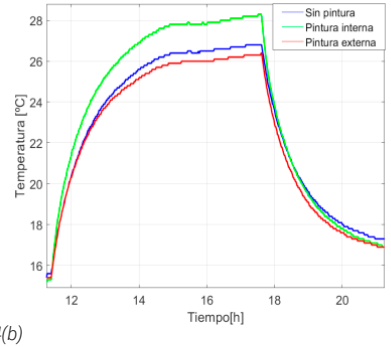
3(c)

Figure 3. Comparison between the data obtained from the mathematical model of the simulation and the experimental data obtained from the physical models. Source: Own Preparation.

Figure 4 shows the internal temperatures of the physical model without the coating, the physical model with the interior coating and the physical model with the exterior coating. Figure 4(a) shows the simulation results of the mathematical model, while Figure 4(b) shows the experimental results on the physical models. As planned in the methodology, the effect of the coating is quantified by the comparison between the internal temperature of the physical model without coating and the internal temperature of the physical models with interior and exterior coating In the case of the physical model with the interior coating, an internal temperature greater than 4.5% was obtained. This fact is due to the effect of the reflection of the infrared radiation on the coating, this hinders the heat loss through the enclosure and contributes to the temperature increase. In the case of the physical model with the exterior coating, an internal temperature was obtained with a 1.9% value lower than the physical model without the coating. This phenomena due to the increase of the roughness which is produced when applying the coating, which in turn causes an increase in the external convection coefficient, which permits heat to be more quickly transferred to the exterior.



4(a)



4(b)

Figure 4. Coating effects on the physical model in the mathematical model of the simulation and experimental values. Source: Own Preparation.

5. Conclusions

This research paper implemented the mathematical model of a thermal zone with the aim to assess the effect of applying thermal insulation coating on their internal temperature. This mathematical model may be extended to analyse larger and more complex thermal zones and by simulation, hence calculating the effect of applying thermal insulation coatings on buildings.

In view of the results obtained by the mathematical simulator and sanctioned by the tested physical models, it is possible to conclude that the application of thermal insulation coatings on building surfaces cause alterations in their behaviour in reference to the heat transfer, which are accordingly improved.

As future research projects, we propose the assessment of the thermal behaviour of the physical models in uncontrolled outdoor environment spaces, hence permitting the acquisition of data on the effects of the thermal insulation coatings against the exposure to sunlight and temperature fluctuations corresponding to day-night weather cycles.

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CHAPTER #5.08

EXPERIMENTAL DETERMINATION APPROXIMATION OF THE STAGE OPENING ABSORPTION SPECTRUM IN THEATRES BY USING THE RESPONSE SURFACE METHODOLOGY. CASE STUDY

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1. Introduction

Reverberation time is one of the key parameters which determine the adaptation of a theatre or music hall to their intended activity. It depends on the shape and size of the enclosure as well as the materials used in the construction of the room and the way they are built (with or without space behind them, flexible, rigid, etc.). To design an enclosure it is needed absorption coefficient of the different construction details. They will be taken from the bibliography, or from laboratory tests. However these values do not always coincide with reality, because ideal conditions and delimited surface at the laboratory cannot be exactly reproduced on site.

Acoustic behavior of a room can be predicted by using simulation programs, taking into account several parameters like volume of the space, materials and how they are set up; also an existent room test can be conducted in order to improve acoustic behavior, for example.

Generally, design is an iterative adjustment process of the variables which define the acoustic behavior of a room. As an alternative to this iterative process, the response surface method (RSM) can be applied (Llinares, 2012). This method has been used in several science fields. The RSM explores the relationships between several explanatory variables and one or more response variables. The main idea of RSM is to use a sequence of designed experiments to obtain an optimal response using a second-degree polynomial. This model is only an approximation, but it is an easy model to estimate and apply, even when little is known about the process.

To apply this method in rooms conditioning, the absorption coefficient of every surface must be known except for two, the independent variables, whose values determine the response (reverberation time in this case).

The stage tower of a theatre is all the space contained by the stage from top to bottom, and from front to back; it is opened to the audience through the stage opening. This is a space of variable dimensions, which contains catwalks, grids, flyloft and other elements.

The absorption coefficients of the stage opening represent the absorption of the whole stage tower (Carrión, 1998). Several authors have proposed their own values (Arau, 1999; Carrión, 1998; Cavanaugh, 1998; Knudsen, 1988).

Due to the physical characteristics of the stage opening it is not possible to measure its absorption in a laboratory. So the origin of these values is undetermined.

A first attempt to use the RSM to study this particular issue has been carried out by the study of the case: Alfons Roig Auditorium, located in the San Carlos Arts and Crafts Faculty of the Universidad Politécnica de Valencia.

Frequency (Hz)	125	250	500	1000	2000	4000
Stage opening	0.3	0.35	0.4	0.45	0.5	0.55

Table 1. Estimated absorption coefficients of a theatre stage opening.

2. Method

An on site measurement has been conducted in this study, acoustical parameters from impulse response of the room and an acoustic simulation by ray tracing in a 3D model have been calculated.

To obtain the on site measurement the sound source and the 15 reception receiver points have been located (non symmetrical in relation to the room axis). The measurement has been carried on twice, one with the curtain closed and another one with it undrawn. There was no audience during tests.

Measurements were registered with DIRAC software (DIRAC, 2009); afterwards a file treatment has been done to obtain the room acoustic parameters.

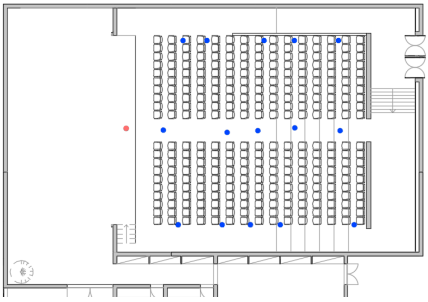

Figure 1. Sound source (in red) and microphones situation (in blue).

A 3D Autocad model inside of a completely absorbent box has been done. Then it has been imported to Odeon software (Odeon, 2009), and the data of the source and receivers location, the absorption coefficients and the scatter have been typed in.

Materials used in the simulation are shown in Table 2; a number was assigned to each to work with them.

Next, the model was run to validation. Since there were two groups of measurements (with and without curtain), two validation processes with RSM were conducted.

Zone	Materials	Surface No.
Ceiling	Rough concrete	1
Lateral surface over wooden ceiling	Rough concrete	2
Back and slotted ceiling	Panel w/ 102mm slot w/ mineral wool	3
Pavement	Linoleum	4
Seats	Well upholstered seats	5
Inferior drilled back	19%drill+60 mm wool +10 mm cavity	6
Stage opening	Drapes heavy velour	7
Front stage pavement	Wooden platforms w/ cavity	8
Control room	Glass	9
General room finish	Phenolic panels w/ cavity	10
Slope wooden ceiling surfaces	Wood panel w/ cavity sup. to 100mm	11

Table 2. Materials used in the simulation, number assignment.

Surface No.	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
1	0,020	0,030	0,030	0,030	0,040	0,070
2	0,020	0,030	0,030	0,030	0,040	0,070
3	0,030	0,400	0,790	0,910	0,760	0,700
4	0,020	0,020	0,030	0,040	0,040	0,050
5	0,490	0,660	0,800	0,880	0,820	0,700
6	0,330	1,000	0,960	0,770	0,710	0,590
7	0,140	0,350	0,550	0,720	0,700	0,650
8	0,400	0,300	0,200	0,170	0,150	0,100
9	0,180	0,060	0,040	0,030	0,020	0,018
10	0,420	0,210	0,060	0,050	0,040	0,040
11	0,300	0,200	0,200	0,100	0,050	0,050

Table 3. Absorption coefficient of the materials used in the simulation.

3. Results

3.1. Model validation with curtain

The reverberation time of the room, with the curtain closed, obtained with DIRAC software is the following:

	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
On site measurement	1,084	1,029	1,066	1,249	1,243	1,016

Table 4. RT 30 measured with closed scene opening.

As unknown surfaces 10 and 11 were taken (phenolic panels and wooden ceiling panels).
RSM was applied to obtain a study region per surface and were combined between them to get 9 absorption spectrum combinations.
The new absorption spectrum couples were introduced in Odeon to calculate the reverberation time of each. On site measured reverberation time was confirmed to be between the maximum and minimum values calculated with the combinations.
Obtained reverberation times were grouped by frequencies, creating 9 combinations of three points by frequency. The surface response which fit with those has been drawn. From each surface new couples of points which satisfied the target have been obtained.
A table of the combinations pairs by frequency has been made, and new absorption spectrum coefficients combinations of the 10 and 11 surfaces have been done. A reverberation time for each was calculated and then compared to the on site measurement.
Values of RT30 are shown in Figure 2. It can be seen the absorption spectrum of the on site measurement with an upper and lower margin of 0.1seconds, within these margins values of the model can be considered acceptable. Also the room Odeon model it is represented, in green model with the bibliography values, in orange (tr2) model after RSM process. The absorption spectrum, tr2, is within the acceptable margins.

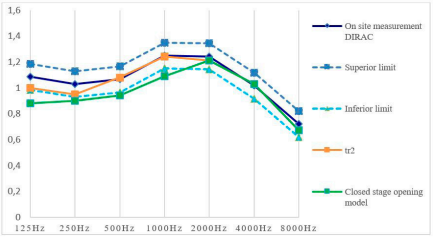

Figure 2. Reverberation time. Adjusted value tr2, compared to on site measure, initial model, and superior and inferior limits.

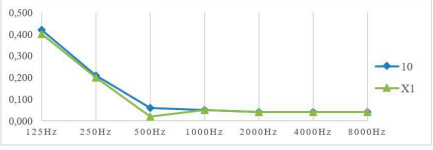

Figure 3. Absorption spectrum of the phenolic panel (bibliography-blue - after RSM -green-).

Figure 4. Absorption spectrum of the wood en ceiling panels (bibliography -red- after RSM- purple-).

The 10 and 11 absorption spectrums correspond with the bibliography data of the phenolic panels and the wooden ceiling panels, respectively. X1 and X2 represents the values after using the RSM. New values were accepted.

3.2. Model validation without curtain

Having fitted the room with closed stage opening, same procedure was conducted to study the room with undrawn curtain.
The reverberation time of the room, with the curtain opened, obtained with DIRAC software is the following:

As unknown surfaces stage opening and wooden ceiling panels were chosen.
Data have been typed in the Odeon Software and after an analogous procedure; finally, with the third combination the next figure was made.

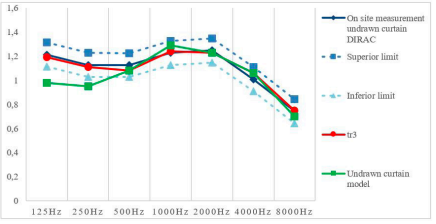

Figure 5. Reverberation time. Adjusted value tr3, compared to on site measure, initial model, and superior and inferior limits.

Values of the RT30 can be observed in the Figure 5. As before, the absorption spectrum of the on site measurement with an upper and lower margin of 0.1seconds can be seen. Also the values of the model are represented, in green with the bibliography values, and in red, the values obtained after RSM application. The absorption spectrum tr3, is within the acceptable margins.
Absorption spectrums 10 and 11 correspond with the bibliography data (or the fit ones in the previous part) of the stage opening and the wooden ceiling panels, respectively. X1 and X2 represents the values after using the RSM. New values were accepted.

Figure 6. Absorption spectrum of the stage opening (bibliography-blue - after RSM -green-).

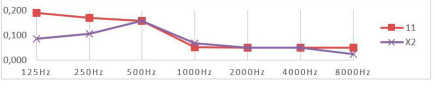

Figure 7. Absorption spectrum of the wooden ceiling panels (after RSM closed curtain -red- after RSM-purple-)

	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
On site measurement	1,213	1,127	1,126	1,227	1,247	1,008

Table 5. RT 30 measured with opened scene opening.

4. Discussion

After seeing the results, it can be said that the use of RSM to fit the absorption spectrums of the surfaces of a room, allows working with two surfaces with undetermined values simultaneously. This helps the detection of influential and non influential variables in the final result (reverberation time of the room).

This is a very systematic method, although a bit long, therefore, for small rooms or when the researcher has more experience, it is easier to use the iterative traditional method.

Its main utility, in this case, is that it allows us obtaining data of non superficial elements, which is hard to obtain the other way. It also can be used to check the behavior of the room, and when it is bad, to detect which of the surfaces is responsible of it; which will derive to change the construction design of that surface.

This is a work in progress, so further analysis can generate new conclusions.

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CHAPTER #5.09

AFFECTIVE EVALUATION OF LIGHTING IN PARKS AND GARDENS

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1. Introduction

Lighting of parks and gardens has a great interest since they are one of the most used and appreciated elements of the public space of the city. Lighting of green areas can become a source of inspiration, admiration, and emotion so it is considered essential that its design be linked to meet the expectations and needs of citizens in order to design spaces emotionally efficient illuminated. Public lighting improves visibility and provides orientation. It also contributes to the perception of comfort and safety of people outside after dark (Knight, 2010). In the design of outdoor lighting, the influence of individual characteristics and the personality dimension of trust in the physical environment must be taken into account (Johansson, Rosen, & Küller, 2010) since the use of urban space at night varies considerably from one person to another. Thanks to technical progress in construction of light sources, nowadays it is possible that the lighting of parks and gardens not only provides the pleasure of discovering new beauties, but also allows to reach important social objectives (Casal Lopez-Valeiras, 1961).
However, the studies that have tried to analyse the response of users to urban lighting come from the field of psychology or engineering, with questionnaires carried out by experts and who have not taken into account in their studies the parameters of the luminous design that can respond to the needs of the user. This need is a fact contrasted in many areas of product design, where it has been shown that concepts perceived by some groups may have different meanings in others. In this sense, Kansei Engineering (KE), also known as Emotional Engineering, is able to identify and quantify users' perceptions of a product in their own language and to find quantitative relationships between these subjective responses and design features (Nagamachi, 1995). The advantage of KE over other similar techniques (QFD, Conjoint analysis, etc.) is that it enables the establishment of a suitable framework to work with symbolic attributes and user perceptions not defined by experts, but expressed through the user's own words. Nevertheless, to our knowledge, there are no examples of the application of KE to urban lighting with the aim of measuring pedestrians' responses.

2. Objectives

The general objective of the present paper is to analyse the pedestrian's affective impressions of lighting in parks and gardens and the incidence of such lighting on the sensation of perceived safety of pedestrians.

3. Material and Methods

The methodology is based on a field study that was carried out during the months of January, February, March and April of 2018 in València (Spain). A sample of pedestrians assessed "in situ" the artificial lighting (in the absence of natural lighting) of a group of parks, as well as their sense of security regarding the activity of walking in the area.

3.1. Subjects

The participants were 300 pedestrians (114 male and 186 female). Their mean age was 35.13 years, with a standard deviation of 14.57.

3.2. Research settings

The parks and gardens of València were grouped by different typology and different type

Figure 1. Parks and gardens in the stimuli sample.

of lighting. 19 spaces were selected, first, on the basis that their luminous environments were sufficiently representative and differentiated to form part of the sample. Figure 1 shows the set of valued spaces.

3.3. Questionnaire

The questionnaire had three types of variables:
1) Objective variables that collected information on the individual, i.e. age, gender, profession and vision problems.
2) 37 expressions describing pedestrians' affective impressions of the luminous environment of the park or garden.
3) These items were selected from a set of adjectives found through a process of compiling adjectives from users' opinions, scientific documentation, specialized bibliographies, the Internet, journals and professional lighting magazines.
4) The initial list of words was reduced to 34 adjectives after the application of the affinity diagram (Terninko, 1997), a technique that consists of forming groups of similar words, according to their affinity, and assigning one significant word to embrace all the expressions in the group. These adjectives were included in the questionnaire with the expression: "In my opinion, the luminous environment of this park seems to me ..."
5) Two variables to reflect the overall evaluation of the luminous environment. One collected the overall assessment of the lighting of the area evaluated with the expression "in general, the park is well lit" and the other collected the sense of security in the area with the expression "the lighting of this area gives me security".
All variables were evaluated using a 5-point-Likert scale, ranging through totally disagree, disagree, neutral, agree and totally agree.

3.4. Development of the field study

The field study collected the interviewees' evaluations of the lighting of the parks where they were, at that moment, physically located. As the subjects had to evaluate the luminous environment in situ, they were "immersed" in the stimulus. The average time taken to complete the questionnaire was 10 minutes.

3.5. Data processing

The data were processed statistically using SPSS software. In the first place, the set of

affective impressions, or semantic axes, was identified, using Factor Analysis. These factors represent the conceptual scheme that pedestrians use to describe their feelings about the lighting of a park or garden.
After that, the impact of each of the factors on the global assessment of lighting and sensation of perceived safety was identified. To establish this relationship, linear regression models were used. Finally, the relationship between the lighting global assessment of an urban area and the sensation of perceived safety of the pedestrian was analysed.

4. Results

4.1. Identification of significant affective impressions representative of the pedestrian's affective response to the lighting of parks and gardens

Factor analysis grouped the 34 expressions in the questionnaire into five axes or factors; they explain 72.50% of the variance (Table 1).
The five factors extracted from the factorial analysis represent the independent concepts that pedestrians use to express their impressions about the lighting of a park. The name assigned to each of the factors is given by the set of original variables that make it up, taking into account in the first place the contribution of each one of them. The first factor represents the perception of the lighting as singular and interesting; the second factor represents the feeling that the lighting is planned; the third, the feeling that it is glaring and powerful; the fourth, the impression that it is pleasant and cosy; the fifth factor includes the assessment of the lighting as uniform and sustainable.

4.2. Analysis of the relationship between affective impressions and global assessment of parks and gardens lighting

The regression analysis identifies a predictive model of the assessment of parks and gardens lighting formed by the five factors representing the affective response of the pedestrian to lighting (Figure 2).
The R coefficient is 0.787, so the model has good predictive ability. There are two factors with a very high contribution to the model, lighting Planned and Pleasant/cosy. These factors are followed by perceptions that it is Singular/interesting, Uniform/sustainable and Glaring/powerful, that is, it is also important that the lighting of the park or garden transmits to the pedestrian the impression that it is a singular/interesting lighting, illuminated in a uniform way (without dark spaces) and sustainable; in addition, that it is a glaring and powerful lighting.

Factors	Meaning of the factors	Concepts included	Variance explained
1	Singular / Interesting	singular (0.785), interesting (0.742), innovative (0.726), expressive (0.722), monumental (0.719), wonderful (0.719), stimulant (0.706), impacting (0.643), beautiful (0.546) and sensitive (0.478)	20.27%
2	Planned	planned (0.779), balanced (0.677), sufficient (0.674), efficient (0.672), functional (0.628), appropriate (0.609) and recommendable (0.551)	15.80%
3	Glaring / powerful	glaring (0.872), saturated (0.800), powerful (0.774), bright (0.696), colourful (0.586), perfect (0.472) e informal (0.410)	13.30%
4	Pleasant / cosy	pleasant (0.737), cosy (0.670), comfortable (0.664), peaceful (0.654) and cheerful (0.562)	12.12%
5	Uniform / Sustainable	uniform (0.730), sustainable (0.729), natural (0.650), clear (0.518) and healthy (0.426)	11.01%

Table 1. Factors representative of the lighting of parks and gardens.

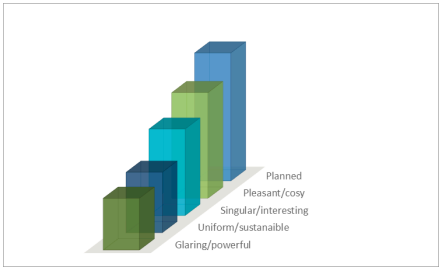

Figure 2. Relationship of the semantic axes with the global assessment of lighting.

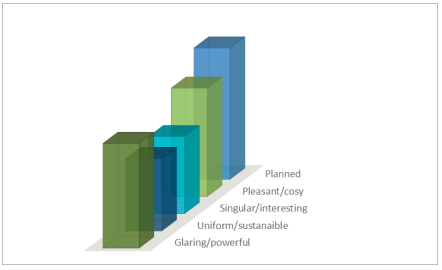

Figure 3. Relationship of semantic axes with the sensation of perceived safety of pedestrians.

4.3. Analysis of the relationship between affective impressions and the incidence of lighting on the sensation of perceived safety of pedestrians

The regression analysis considers significant the set of affective dimensions. The model obtained has a very high predictive ability (R = 0.722). The factors with the highest incidence in the sensation of perceived safety (Figure 3) are Planned and Pleasant/cosy. These two factors present a very high contribution to the model. In this sense, it is important to note that the Planned axis seems to be related to the pedestrian's feeling that the lighting is adequate enough to generate also the feeling of comfort. These results agree with those obtained by Boyce et al. (2000) who found that lighting is an important factor in determining people's perception of safety during the night.

Subsequently, and in order of importance, it is found that lighting is appreciated as Glaring/powerful, Singular/interesting and Uniform/sustainable, that is, when evaluating a luminous environment from the point of view of safety it is important that the pedestrian considers it planned and pleasant/cosy but also that an important level of illumination is appreciated (related to the feeling that it is dazzling); that the lighting provides the feeling that it has something of singular or interesting and, finally, that it is appreciated as uniform/ sustainable. In this sense, it is widely known that both the uniformity of lighting and the presence of disabling glare are also important for the perception of safety (Boyce et al., 2000).

4.4. Analysis of the relationship between the global assessment of the lighting of parks and gardens and the sensation of perceived safety of pedestrians

The beta coefficient of the regression model was used for the comparison between the global assessment of lighting and the sensation of perceived safety (Figure 4). In both models, it is observed that all axes are important. In addition, in both cases, the fundamental thing is that the lighting is perceived as Planned and Pleasant/cosy.

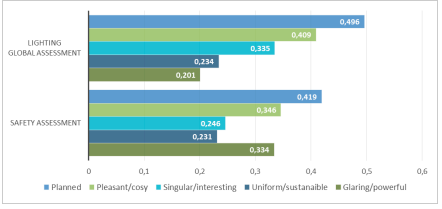

Figure 4. Comparison between the models of lighting global assessment and the perceived safety of the pedestrian.

The main difference between both models is in the Glaring/powerful factor, which appears as fundamental in the case of perceived safety and, however, is the least important in the global assessment of lighting. These findings are in line with the results obtained by Peña-García et al. (2015) where well illuminated streets (that is, where lighting is uniform) with higher illuminance levels, tend to make people feel safer and better.

5. Conclusions

This paper aims to analyse pedestrians' affective responses to the lighting in parks and gardens and the incidence of such lighting on the sensation of perceived safety of pedestrians. In the first place, the affective response of the pedestrian to the lighting of a park or garden was extracted. The factorial analysis identified the following factors or axes: Singular/Interesting, Planned, Glaring/powerful, Pleasant/cosy and Uniform/sustainable. These factors represent the set of independent factors that pedestrians use to describe their impressions of the lighting of a park or garden.

Regarding the global assessment of a park lighting, the two factors that have the greatest impact on the overall assessment is that the lighting is considered as Planned and Pleasant/cosy.

On the other hand, to improve the sensation of pedestrian safety it is necessary that the lighting is perceived as Planned and Pleasant/cosy. Moreover, it is important that the pedestrian considers the lighting as powerful, which increases their sense of perceived safety.

Regarding the relationship between the variables of global assessment of a park lighting and the sensation of perceived safety of the pedestrian, the fundamental difference occurs in the Glaring/powerful factor, which appears as important in the case of perceived safety and however, it does not seem so important in the lighting global assessment.

These results can be of interest for architects, engineers and lighting designers, to develop new lighting of green spaces which attempts to satisfy citizens' specific expectations. In addition, these data can be useful when making modifications and adaptations to existing installations.

The most important limitation of the study include the fact that the experience took place in real spaces. This has the disadvantage that the various elements that may influence perception were combined in the real parks and gardens. To reduce the impact of this bias, the solution adopted here is the one described by Kish (1995) as a way of controlling an experiment, by including variables randomly, on the basis that chance will generate equivalent distributions of the units in all the variables under study. Thus, the bias produced is smaller

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CHAPTER #5.10

ADAPTABLE BUILDING ENVELOPES

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1. Introduction

The building envelope comprises a unique autonomous and complex component that bridges the internal with the external conditions, protecting the users from environmental changes. In architecture there are some built elements that exist from early years. Kinematics and automations in façade design have evolved progressively throughout the years. Venetian blinds for example originally formed the first responsive facade system in ancient Persia and were patented in Great Britain in 1760 (Heidari Matin et al. 2017). Venetian blinds have the ability to fold and unfold or rotate to open and close for sun protection and privacy.

Adaptive architecture relates to the need for interaction, environmental feedback and self-adjustment by the users (Heidari Matin et al. 2017). The term 'adaptable' for the building envelope carries a complex definition in terms of form, geometry and transformability and may lead to smart, innovative designs. Adaptable envelopes may provide efficiency in terms of sustainability and better living conditions for the users, if self-control mechanisms are integrated within the façade structure. The implementation of kinetic mechanisms in the overall facade system enables the structure deployment from a compact configuration to a larger, expanded state, in which it can fulfil its architectural function (De Temmerman et al. 2012).

Adaptable building envelopes presented in the current paper follow a respective classification of rigid and soft mechanisms as to their structural composition and behavior. Adaptable envelope structures of rigid members are categorized in tensegrities and scissor-like element systems. Elastic elements, such as bending-active members, can form single or double curvature surfaces according to the type and magnitude of the forces applied for their specified elastic deformations. Along these lines, the current paper presents two case design examples of hybrid systems, while each combine in series and in parallel, rigid and soft element components, in achieving controlled kinematics, structural stability and improved functionality of the envelope structure. The use of bending principles in hybrid systems with rigid members enables not only initial complex geometries and their subsequent stabilization through additional prestress, but also the capability of the structure to undergo reversible deformations (Schleicher, 2016).

2. Kinetic Mechanisms

2.1. Rigid Mechanics

Rigid elements comprise the body of the kinematic mechanism, and are connected to each other in pairs to transmit force and motion. Rigid mechanisms are categorized in tensegrities and scissor-like element systems. Tensegrities comprise self-stressed structures of rigid bars and cables enabling translation and rotation in their deployment. Deployable tensegrity structures are composed of lightweight rigid elements of variable length, through the use of telescopic tubes as compression members or cables with pulley connections at the joints. Scissor-like elements consist in principle of two bars connected to each other at their intermediate points with a pinned joint, that enables relative rotations of the former and therefore, geometric transformations. Through alteration of the scissor joint position, translational, polar and angulated units may be obtained yielding respective configurations in the deployed state of the system (Maden et al. 2011).

The adaptable envelope structure of Al Bahar Towers is based on kinematic principles of spatial scissor-like elements. The role of the

folding external envelope units designed by Aedas in 2012, was the sun protection and heat gain, the glare avoidance during working hours, the protection from wind and dust, and the minimization of cooling loads on the towers. The kinetic envelope system consists of 1049 units for each tower that are shaped in triangular structures of 15 elements each (Karanouh et al. 2011). The components are made of PTFE (Polytetrafluoroethylene) and glass fiber-reinforced polymer. These have been tested to operate in high temperatures and wind loads. The electromechanical technology used is centrally controlled, both for the energy technology HMI & BMS and for all sensors with no users' interaction allowance (Heidari Matin et al. 2017). Hydraulic, linear actuators are responsible for the mechanism's kinetic operation.

2.2. Soft Mechanics

Elastic elements, such as bending-active members, acquire shape formations by externally acting forces on the deformable members with low thickness. In structural terms, bending-active members are constrained statically non-determined structures with residual bending stresses (Lienhardt, 2014). Elastic deformations are also observed in gridshells and elastic plate structures that have similar load-deformation behavior in acquiring their respective curved geometric forms by bending.

Bending-active members have been originally implemented as shading elements in the biomimetic media façade for the Thematic Pavilion at Expo 2012 in Yeosu, South Korea (Schinegger et al. 2011). The facade elements are made of slightly curved plates of glass fiber-reinforced polymers supported by two hinged corners at the top and bottom. In the other two corners, a small compressive force is applied by an actuator in the plane of the lamella, which leads to controlled buckling. Thus, the structural effect responsible for the members' kinematics is initiated by lateral torsional buckling and continues as non-symmetrical bending mode. A further example is the SoftHouse Project's adaptive façade. The development originated from a kinematics' investigation in strip-like configurations to conclude to a highly adjustable, multifunctional adaptive skin. The strips' membrane covering consists of both glass-fiber mesh and elastic tensile material according to the elongation tolerance in each case individually. The façade components provide three types of actuating force; linear actuation, responsible for swivelling the element at mid-span locations, rotating actuation supports to form twisting reactions, and sliding roof-end supports to provide bending deformations (SoftHouse Project, 2014).

3. Hybrid Kinetic Systems

In the frame of current investigations, hybrid kinetic systems are considered to combine soft and rigid mechanisms in their composition. Along these lines, the hybrid systems presented hereafter are composed of scissor-like elements and bending-active members coupled in series and in parallel. Hybrid mechanisms have an increased complexity in their kinetic operation, due to the components interdependency and interactive role in the global transformability and stability of the system. The soft mechanisms follow the transformation process initiated by the rigid elements and the mechanical control components, and are responsible for the self-equilibrium of the system throughout its operation (e.g. form-found, prestressed) states through their nonlinear elastic deformations. Furthermore, their capability to undergo reversible deformations is associated with less energy consumption during the entire transformation cycle. The use of passive technologies on kinetic adaptable envelope systems is envisaged to lead to a new class of mechanics with less control components, instead with self-autonomous components responsible for the local and global resulting transformation stages.

3.1. Rigid-Soft Mechanisms in Series

The adaptable envelope acts as an architectural technological filter between the external- and internal built environment and regulates heat, natural lighting and ventilation (Phocas et al., 2014). It consists of two types of interactively

transformable membranes of different physical properties, Fig. 1. Initially the primary membranes linearly supported by bending-active members are stretched on the vertical and horizontal façade planes. The secondary membranes linearly supported by scissor-like elements are folded horizontally between the primary membranes. Due to this differentiation, the natural light penetration is respectively regulated in the interior in periods of high and low temperature. Natural ventilation is enabled through a separate mechanism that regulates the porous skin of the secondary membranes.

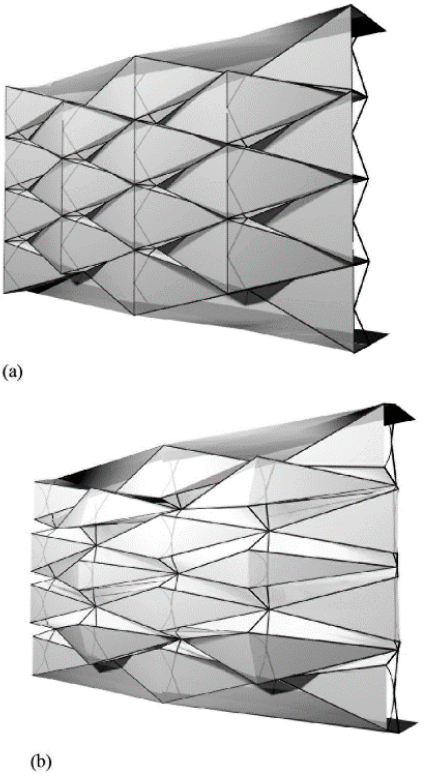

Figure 1. Envelope structure: (a) Initial (closed) configuration state; (b) Target (open) transformation state.

The primary structure consists of four or three vertical positioned bending-active members interconnected through scissor-like elements and a continuous cable. In the horizontal direction, secondary cables connect at the joints of the vertical elements, e.g. adjacent joints of bending-active and scissor-like elements to primary cables. In this way a tensile net is formed for the required in-plane stability of the structure, Fig. 2. In the initial configuration state, the scissor-like elements are in closed, horizontal position. All cables' connections are connected to the scissor-like elements' joints and the bending-active members through pulleys equipped with electromagnetic brakes to act as static joints within each structural configuration. In the horizontal direction the primary structure is positioned at distances of 2.0 m, alternately as to the units' sequence. The edge primary structures have constant geometrical characteristics and serve as rigid structural planes for the anchorage of the tensile net. The slabs serve for the fixed supports of the primary structure. In all cases, according to the given floor heights of the building under consideration, the structure span may be accommodated through respective initial curvature of its elastic primary elements.

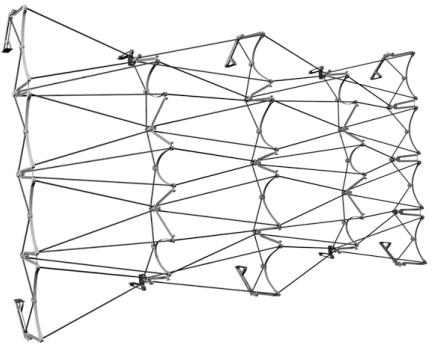

Figure 2. Envelope structure of scissor-like elements and bending-active members in series.

The bending-active members change their curvature through modification of the primary cables length, and induce a respective motion of the adjacent scissor-like elements. Reduction of the primary cables length induces deformations to the bending-active members, which in turn cause in-plane outwards rotation of the scissor-like elements. The reverse movement for inwards rotation of the latter is enabled through increase of the cables length and release of the corresponding mechanical energy accumulated in the bending-active members. Due to the flexibility of the form-active structure, a displacement of the bending-active members' middle joints in the perpendicular plane supports the opening up process of the scissor-like elements during the transformation process, although at the same time the opposite displacement of the elements' joints decreases respectively their maximum possible opening. Furthermore, by selecting fixed connection joints of the scissor-like elements, non-symmetrical transformations of the structure would be feasible. The membranes are assumed to be flexible enough to accommodate the movement of the primary structure without having any interaction on the transformation process of the primary members.

3.2. Rigid-Soft Mechanisms in Parallel

The adaptable prototype envisages to replace in its operational states the conventional double façade concept, through its spatial transformability under environmental performance criteria with regards to seasonal and time-varying natural ventilation, lighting, sun protection regulation and cavity space (Proestos, 2017). The prototype unit consists of a diagonals pair supporting a bending-active member coupled with a cable element with variable length and connected over sliding joints to a wing funnel-like element, placed in parallel and working in bending. In system scale, the development of the particular mechanism is based on a parallel arrangement of a scissor-like element, a cable bending-active member and a spatial wing element with bending capabilities in the longitudinal and vertical transverse directions. In members' scale, the elastic kinematics are decisive for the transformability of the members in generating bending and tension prestress throughout the transformation, Fig. 3.

The kinematics of the prototype has been initially determined based on the operability of the individual elements and their coupling interdependency as a whole. Reduction of the bending-active member's cable length and consequently inward rotations of the diagonals at the support, induce bending deformations of the member followed by sliding of its joints to the wing element. Beyond the respective sliding limit, bending deformations of the wing element follow. The backbone of the element is bent in longitudinal direction and recurved surfaces are formed in the side planes, which transform the element in closed state. Throughout the transformation, the unit's height increases. The use of bending principles in the particular prototype enables not only flexibility and

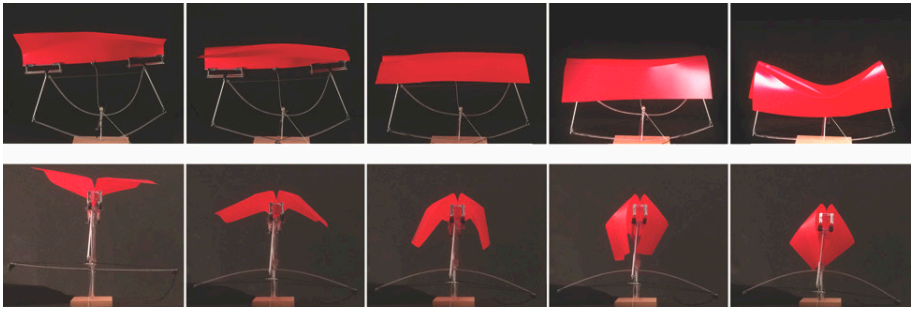

Figure 3. Physical small-scale modelling of prototype unit's transformability.

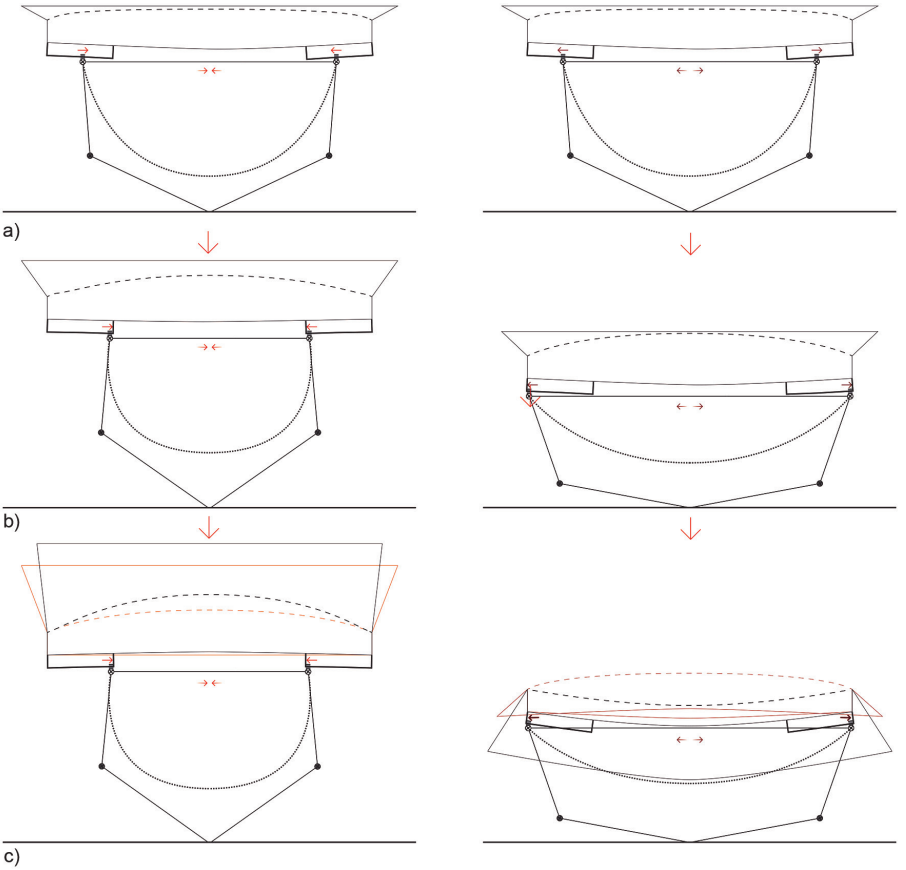

Figure 4. System kinematics; a) equilibrium state, b) bending-active member's deformation state, c) wing element deformation state.

transformability of the initial system and its self-stabilization, but also the capability of its members to undergo reversible deformations without additional energy supply from an external source. In this frame, actuation of the structure through increase of the cable length induces relaxation of the bending-active member and consequently outward rotations of the diagonals at the support. Beyond the sliding limit of the bending-active members' joints, respective bending deformations of the wing backbone element enable an opening of the wing side planes. Throughout the process the unit's height decreases, Fig. 4.

4. Conclusion

Adaptable building envelopes act in response to the multiple changing environmental conditions, while structurally performing by reconciling flexibility, stability and energy-efficiency. In the current paper basic rigid and soft kinetic mechanisms have been reviewed and their hybridization has been proposed, in order to increase the multi-ability of the system in its transformability and operational states. Two hybrid envelope structure designs presented, clarify the interdependencies of their rigid and soft structural components in providing active transformable mechanisms.

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CHAPTER #5.11

PROBLEMS IN THE ADOPTION OF BIM FOR STRUCTURAL REHABILITATION

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1. Introduction

The Architecture, Engineering and Construction (AEC) Industry has been changing during the last years for several reasons. The appearance of new technologies like Building Information Modelling and techniques like Lean Construction or life cycle analysis are creating new trends and opportunities that alter the methodologies of this industry. Moreover, in the recent years the business model is also suffering changes. Rehabilitation is gaining more and more importance in the AEC Industry. In 2001 the annual turnover in Spain was 77,7% from new buildings and 22,3% from renovation and rehabilitation, while in 2014 the percentages were 44,3% and 55,7% respectively ("Observatorio de Vivienda y Suelo. Boletín Anual 2017," 2017) with a total of 25.825 buildings under renovation on the year 2015. These changes are not stationary and in the near future the trend will continue leading the industry to new horizons. As Eastman stated "This is an exciting time to be an architect, an engineer, or any other AEC industry professional." (Eastman et al., 2011).

Many authors have stated (Volk et al., 2014) that BIM is leading this change, but there isn't still a broadly adopted definition for BIM which difficults its understanding by the Industry. Following the explanations given by National BIM Standard - United States (2016) and Eastman et al. (2011), BIM could be defined as a trichotomy of a product, a methodology and a software. This differentiation proves that there isn't any ontological approach to the BIM definition (Matějka and Tomek, 2017), that some professionals have a partial view of the concept and that the three aspects are used indistinctly. This means that BIM is a mix between the three, formed by an n-dimensional matrix of the project's data where the user can define and relate new dimensions and variables inside them. There are predefined dimensions like geometry or areas, but the user can add new ones like weight, cost or sustainability. This data forms a digital model, and it is what is understood as a "product", in some cases named Building Model. To create this Building Model the user utilizes a specific "software" and follows a "methodology" to define the model, its variables and the connections and constraints among them.

The widespread adoption of BIM is logical considering its capabilities and the great amount of advantages that it can provide. The key advantage to BIM is the accuracy in the geometrical representation and the other parameters defined in the project. This speeds the processes related to the AEC Industry making them more efficient and improves the design while detecting and solving possible problems or incompatibilities (Azhar, 2011). Several professional can work at the same time on a BIM Model and the modifications are coordinated. Also, the BIM environments can implement Building Performance Simulation (BPS) tools with ease and integrate the automatization of processes to handle new criteria like sustainability (Diao et al., 2011), energy consumption or risk management (Zou et al., 2017). It also provides ways to handle the Black Box Effect derived from the excessive automatization in processes (Fernández-Mora, 2018). This great level of automatization and control is directly shown in the cost, producing savings of up to 10% of the contract value and a 7% reduction in project time (Azhar, 2011).

BIM can also handle time-related parameters and stablish objects that exist at some points and disappear at others. This can be used to implement the renovation project into BIM,

following the actual trend of the AEC Industry. In the bibliography we can find a few examples of researches to this (Volk et al., 2014) and techniques to apply point-cloud technologies[1] to create accurate Building Models (Jung et al., 2016) are becoming vital to gather accurate data. Despite this, the connection between BIM and the rehabilitation project, has not been developed by the Industry. Considering the expansion that the research in BIM has had in these last years, we can assume that there exist some problems which prevent this use for BIM. In this paper we are going to define these barriers and try to find a way to work around them. Our aim is to find a way to implement the structural rehabilitation and design the structural reinforcement into BIM.

Regardless the methodology applied on a restoration there is a difference between the terms rehabilitation and reinforcement that needs to be clarified to avoid future misunderstandings. Rehabilitation is the reacquisition by the elements of their initial capabilities, allowing them to perform the same as before they had received the damage. Instead, reinforcement is defined as an increase in the structural performance of the element (Calavera, 2005). Most of the techniques are valid in both cases, but there are some that are not. As our focus is the structural reinforcement we will be increasing the actual structural performance of the element even if that means just to recover its original state.

2. Methodology

The big difference between BIM applied on new buildings and rehabilitation is the existence of a building as a base point and the need to know how this building has been built and how to reproduce it in BIM (Almeida et al., 2018). So far, we have proved the advantages of BIM to the industry and the necessity to adopt its procedures, so it is normal to assume that, in fact, there exist some barriers regarding this adoption and that they probably lay in the rehabilitation problem's nature.

To find the problems we need to further study the actual methods and methodologies used in the structural rehabilitation project and then compare it to the BIM procedures. This analysis is going to be divided in two main parts. First, the methodology used by the professionals to acquire enough information about an existing structure. Second, the different theoretical approaches to obtain the efforts that define the structural behaviour and design a structural reinforcement. While there can be specific solutions we will cover only generally adopted ones, as they fit better into the BIM environments.

2.1. Structural surveys

To use BIM in a satisfactory way we need to develop not only the tools, but the methodology to use it. For this, we need to stablish the actual methodology used by the professional to determine the demands of the building and analyse how it fits into BIM. To study the procedure in developing a structural survey our research data was collected from personal and non-personal (Almeida et al., 2018) professional experience and from a restoration manual (Vegas López-Manzanares, 2017). From there we have stablished common points in the different processes and developed a pattern that can be seen in Fig. 1 that synthetizes the process.

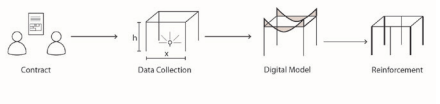

Figure 1. Process of the structural rehabilitation.

Most of the times the professional is contacted by the building's responsible who exposes the new needs of the building and its actual problems. With that in mind the data collection phase starts, the professional must collect data from the building, its state, possible affection and if possible, historical data. Once the data is collected, it is time to create a structural model of the building, study the new

[1]This technologies are based on the use of 3D-scanners to create a point-cloud to accurately define the geometry of an object and define a 3D Model (Rebolj et al., 2017).

demands for the structure and determine the contribution that the existing element can make to the new structure. In case that that existent structure proves insufficient for the new loads, a reinforcement must be designed and built guaranteeing the right connections between the old and the new parts.

2.2. Structural reinforcement design methods

To design the structural reinforcement and solve the problem it is necessary to understand the building and its necessities. This makes this part the most delicate one as the professional needs to combine the knowledge of the building with its necessities and determine the proper design. A lot of data has to be taken into consideration besides the buildings geometry. The position of the element and its importance to the global equilibrium, the warning capacity of the element, the live loads over the element and the damage that it has suffered among others (Calavera, 2005).

Another important part is the numerical method used to design this reinforcement. On the one side, it has to reproduce the structural behaviour of the element and its real structural capacity. On the other hand, it has to incorporate the state of the element and the contribution needed by the reinforcement. While sometimes is assumed that the existing element does not contribute to the structure and the structural reinforcement is the responsible to held the loads, this is an oversimplification that leads to oversized reinforcements, there are methods proposed by several authors to determine the part that the existing element can handle. (Calavera, 2005) (Hangaru et al., 1997) (Teng et al., 2002) (Newman, 2001).

Nowadays, there are several materials which are widely being used to reinforce a structure and different applications of them depending on the effort to resolve. To determine these techniques and the materials used we have conducted a bibliographical research and extracted the most common used materials and solutions to reinforce a structure. There are three materials that are broadly used to design reinforcement, concrete, steel and fibre reinforced plastic (FRP), and each one has some preferred uses.

3. Discussion

Every problem regarding the use of BIM for the structural rehabilitation can be summarized in one word: uncertainty. This concept can be extended to a lot of points that affect the process and we are going to categorize and analyse each one of them to be able to define the problematic and study it step by step. But this does not change the fact, the uncertainty is what is creating a gap between the rehabilitation and the different automatization processes, because as we have seen a complete preliminary study is vital. There are several points were this uncertainty has to be solved to solve the structural reinforcement.

-Uncertainty in the materials: The specifications of the materials used previously in the structure can be unknown for the professional designing the reinforcement. This is solved with a proper structural study of the building developing a series of tests to determine the characteristics. BIM environments are ready to be used with present materials and the user can define new ones to reproduce the existing characteristics without too much difficulty. Probably, different materials for certain groups of elements should be defined to obtain accurate predictions. There can appear some difficulties when modelling the reinforcement design and new materials are encountered with existing ones. It is also important to note the importance to introduce in the mathematical model the interphase between different materials to accurately define the reinforcement behaviour.

-Uncertainty in the structural behaviour: This has to be understood from two different points. On the one side, the structural behaviour defined when the original design was made. Generally speaking there are three methods to do the structural design (lineal, lineal with redistribution and non-linear) the application of any of these generates deviations of the results from the others (Calavera, 2005) and can imply some mistakes when studying the structural behaviour. On the other side, there is the "real" structural behaviour which can or can't be the same as the original one, due to structural modifications or to different elements receiving structural loads. Phenomenon like repositioning or elimination

of elements, beams with excessive deflection or presence of compartmentation with high stiffness among others can alter the structural behaviour and produce important pathologies and cracks on the building.

-Uncertainty in the design: Directly related with the previous point is the structural design. To determine the exact design and dimensions of every element isn't an easy task, but it is important to find a certain pathology or to design the structural reinforcement. Modelling this structural design can result in a challenge, as BIM software usually is not ready to handle small deviations in an element. It is also vital to define, not only the original design, but its actual state and possible alterations. The use of point-cloud technologies can be crucial to get an accurate definition. If the structural element presents some damage it is also necessary to estimate the affection of this damage to its structural performance. Typically, this has been left to the professional's criteria and most of the time it implied to estimate that the contribution to the structural performance of the element is zero and to design oversized reinforcements. There exist numerical methods like Hangaru et al. (1997) to estimate this damage index, but they result impractical due to high computational demands and the need of data from the original state of the element. Calavera (2005) presents a table with parameters to estimate this damage index.

Aside from that, there is another reason against the adoption of BIM in every rehabilitation project: the difference in scope. A rehabilitation does not have to affect the whole building neither have a great budget. But when using BIM, we need to create a digital model of the building, which implies an investment in time and economy by a professional. This extra time, increases the budget and the delivery time in small projects and it can suppose a great impact which leads to the decision of not to use the BIM methodology.

This is not a problem in the buildings that already have a BIM model, because it can be updated with the current data and pathologies and used for the new analysis regarding of its magnitude. It is not unreal to think, given the actual trend, that in a few years we could have access to BIM models from the design phase of existing buildings, especially in public buildings. At the end of this year 2018 the Spanish Ministerio de Fomento is going to require a BIM model for any public building (ITeC, 2015), this follows an European requirement that sets this objective for 2020 (European Parliament, 2014) and has been required in UK since 2016 (Chi et al., 2014). There are also techniques like point-cloud modelling that nowadays are able to input data into BIM and create accurate models. If the need of modelling the building in BIM disappears in the next years, it will be a great advantage to use this methodology for rehabilitation.

Most of this uncertainty is also a problem if using CAD software, but using BIM we get additional advantages. If using CAD the professional is in need to maintain updated several copies of the drawings. Instead using BIM in the renovation project creates the opportunity to develop the project through the time and define how the elements change along it. This allows the user to follow the evolution of an element and locate the different tests developed on the structure and the changes for the reinforcement, avoiding at the same time some errors due to data misplacement. Additionally the introduction of BPS into BIM introduces analysis tools with the whole picture of the project taken into account automatizing processes and reducing costs.

4. Conclusion

During these last years the AEC Industry has adopted BIM and made use of its advantages. Simultaneously to this technological change there has been a shift in the business model as the number of rehabilitation projects have drastically increased. The use of BIM has been focused on new buildings and has been ignoring this business change, but it can also provide its advantages to these projects. The problems that prevent the adoption of BIM for the structural rehabilitation are:

- Lack of data of the existing building in need of structural reinforcement, which makes mandatory an intense data collection through technologies like point-cloud.

- Inability of BIM software to handle small deviations among different elements (beam deflection or vertical deviations).
- Difficulty in determining the structural design and behavior.
- Inexistence of BPS tools destined to rehabilitation.
- Rehabilitation projects affecting only a section of a building and not justifying the creation of a BIM Model of the building.

Despite these problems the rehabilitation project can make use of the advantages provided by BIM. Due to the great adoption of this methodology by the industry, in the next years the professionals will be gaining access to existing BIM Models when rehabilitating a building making unnecessary the creation of the model for it and erasing some of the problems. But further research is required to integrate the structural rehabilitation as there is a need to define a damage index method and to create a BPS tool able to design the structural reinforcement into BIM.

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CHAPTER #5.12

INTRODUCTION TO DIGITAL FABRICATION AND PARAMETRIC DESIGN AS PROJECT STRATEGY FOR ARCHITECTURE TEACHING: WORKSHOP EXPERIENCE AT THE POLYTECHNIC UNIVERSITY OF VALENCIA

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1. Introduction

The academic curricula being taught in the vast majority of Architecture and Design Schools of the world hasn't changed that much since reinforced concrete and steel were set as major building materials in the first decade of the 20th Century, taking into account the different capacities and specificities expected from architecture professionals in each country and which are subsequently reflected in this academic path (Isabel, Dorado et al, n.d.).

This translates into an academic itinerary with very clear objectives, where it is impossible to include many different materials and construction techniques apart from the ones which have been used since 1900, and which use is nowadays seen as the first option when possible. This leads to subjects as structural calculus or construction among other subject areas, always focused towards a pillar-beam system which provides very specific architectural features. On the other hand, we are currently living on a technological and digital revolution where 4.0 industrial processes are already shaping some buildings currently under construction and will contribute to the architecture of a nearer future. Specifically, the relationship between architects, construction materials, and building technologies are already changing thanks to the extensive use of technologies as CNC, 3D printing, prototyping and mostly varied digital fabrication applications. Digital era is already redefining the way we understand and build architecture, and the further applications of this emerging technologies in this design field will provide new opportunities to future architects (Gul, n.d.).

2. Digital fabrication and parametric design: what it consists on, how they can improve architectural design and path to academic application in Architecture and Design schools

Digital fabrication includes processes accomplished with computer aided design softwares (Kardos & Váncza, 2018) which are then systematized and physically crafted with specialized machinery which may include different technologic procedures. This means that digital fabrication can be taken both as a design process and tool applied to architecture, talking about the generation of complex geometries, the optimization of these to get better outputs or to save in source materials.

The development of any activity or practical exercise related to the learning processes in architecture implies not only an obvious initial investment from the academic institution, but also, adds up an specific physical space in which work will be developed, and specific regulations regarding the use of machinery and the other resources available.

To a lot of academic institutions, it is still quite difficult to accept the cost of implementing this machinery and new resources on their campuses. So, whenever investing on a 3D-laser-machine, specific cutters or molds it is necessary to stablish teaching paths and guided experiences for the students to get the most of these new resources. This way, the institution might recover the initial investment in form of

better performances and new skills acquired by its students.
Implementing this teaching methodologies with minimum costs would only require a couple of laptops with the software in the classroom, where both professor and students could manipulate the design parameters, even without the machinery required to translate the designs into a small physical prototypes. However, not having the possibility to physically test the results and translate the model into reality would mean that the empirical experience would lose its error proofing nature, and so, one important factor expected when acquiring architectonic projectual competences.

Figure 1. Teaching the specific software used at the "Construye lo imposible" workshop to design the piece of urban furniture to be manufactured in a posterior phase of the workshop. Own produced content.

2.1. Related teaching experiences already performed successfully

Digital fabrication technologies and their application on architectural and design procedures is still so new that it is usually learnt through self-learning and not through regulated training programmes, as very few universities have had enough time and resources to process and implement this technology into their curricula.
However, there have been already performed some related teaching experiences regarding this field of study, all of them in different circumstances and adjusted to different curricular or extracurricular programs, and adapted to the available equipment as well (Alvarado & L, 2012). As an example, digital manufacturing was used as a way to develop 2017's final degree projects in the Higher Technical School of Building Engineering at the University of Seville (Spain) (International Conference on Education and New Learning Technologies (9 : 2017 : Barcelona), Gómez, López et al, 2017). The Massachusetts Institute of Technology, or Zurich's ETH University also carry their own specific Masters degree and diplomas focusing in teaching and divulgating digital fabrication and robotics in architecture, offering lectures and conferences regarding the topic (Hjorth, Smith et al, n.d.).
The courses cited previously included from short duration workshops to full subjects up to 300 hours. However, all of them had less than 25 students enrolled, which is already an important sign taking into account that to perform successfully this experiences strongly linked to specific skills and knowledge related to the machinery and the technical processes, it is essential to count on a small group of students to successfully perform the lessons.

3. "Construyendo lo imposible" ("Building the impossible") workshop and teaching experience with digital fabrication at the Architecture School of Valencia

Within the 4th edition of the architecture and culture festival ETSA.TOPIA, which took place at the Superior Technical Architecture School of Valencia between April, 19th to April, 21th 2018 there was held the workshop "Construyendo lo imposible" ("Building the impossible"), mentored by research group "I+D+Arq" and in collaboration with the team at the company "BeMore3D". The workshop was programmed for a whole day (from nine in the morning to eight in the evening with a midday pause) and divided into two thematic areas: theory and practice, where both groups mentored the students that day. The workshop consisted of an introduction to digital fabrication applied to architectural design, as well as different virtual reality and visualization methods (increasingly widespread in the fields of architectural and cultural heritage). Once those guidelines where set, the students had the opportunity to work on-site with the concrete 3D

printer developed by "BeMore3D" and test the design firsthand.
This workshop's main goal was to generate with the students an urban furniture piece outlined with parametric design software (Rhinoceros + Grasshopper plugin) for it to be manipulated later that morning with an open-source software to adapt some of its features. The first part of the workshop's resulted in a small undulating bench about 45 centimeters height and 2 meters width, which was then transferred to the machine on campus. At the end of the day, both the students, mentors and technicians not only contributed in the preparation and disposal of the material in the machine, but also in the supervision of the large-scale 3D printing process. The philosophy behind this bench is to use the machine to put the different layers of concrete, which are reinforced with small metal rods every few layers. When the expected height is reached, a lid that acts as a seat is then placed.

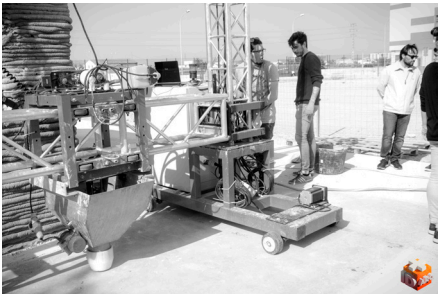

Figure 2. BeMore3D's concrete printing machine and the workshop participants. Own produced content.

3.1. Teaching methodologies and procedures learnt from the experience

When teaching students to build through this particular design process which went from the first ideas conception to the production, the workshop was divided in two parts: the first was a masterclass taking shape as a sort-of-lecture, where there were discussed and reviewed related topics, case studies and manufacturing methods, among others. When talking about teaching methodologies and education in digital fabrication, it's important to provide this lectures, where students can see and discuss the similarities and differences between analog production processes and the digital production process, giving students an understanding of the manufacturing processes used in the construction of the physical form of architecture (Hemsath, 2010). The part of the class where laboratory experiences are undertaken are meant to train the students to gain practical understanding, either through software tutorials or specific manufacturing techniques.
The specific teaching methodologies which aim to develop an interest in digital fabrication in the alumns should be focused on the resolution of a project as to give students practical skills related to completing assignments. Small-scale projects that would help establishing skills needed through physical materialization: furniture, surfaces, real and tangible stimuli and everything that might connect the students with the materials. Only then the students will develop the abilities to use the modeling software in the digital design process, analyze, manipulate and virtually generate shapes and spaces.
Having the tools is not enough: the goal is geting students to use them in their projects eventually. Students are required to learn through error proofing, and translate their knowdledge of the previously undertaken experiences into the next object or project they design. In this aspect, it would be very interesting to have the support, experience and resources that could provide having FABLABS linked to Architecture Schools. As an example, the one at the University of Seville, where its Architecture School has its own design laboratory, where many of the projects that are developed there are linked to the workshops and teaching experiences carried out in the School.

4. Conclusions

After the workshop, we could perceive a great interest both from the alumns taking part on it as from the organizers of the event, due to the underlying task of research and the generation of multidisciplinary synergies transmitted in each of the activities developed there. Some of the main ideas and reflexions taken from this workshop were the following:

- New technologies and methodologies and their physical application
- Concrete use in parametric models based on procedural architecture
- Research on open-source and free parametric software
- Exportation to physical models in an automated way
- Fast product prototyping

It became clear that the actual official study plans have a lack of a continuous update both in projecting methodologies and knowledge of the latest versions of the software that allows them, with which the alumns are forced to a continuous generational gap that moves away from the needs of the real market and society outside the purely academic areas.
We consider that the workshop was a success not only because of the final construction of the piece, but for the generation of a conceptual-productive line based on a continuous and critical renovation of the means of production, both at the level of parametric ideation, generation of automated prototypes, update and customization of these prototypes with a high procedural control and the application of digital manufacturing as a new constructive methodological paradigm applicable to architectural projects that can be done by any student, both in the Architecture School and outside it, out at the professional world.

Figure 3. Picture of final results of the workshop. Students who took part at the workshop and the organizing staff. Own produced content.

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CHAPTER #5.13

INFLUENCE IN THE MODELING OF BOUNDARY CONDITIONS BETWEEN ANALYSIS MODELS AND REAL STRUCTURES

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1. Introduction

The singular architecture of large spans is usually resolved with metallic steel structures, in the form of truss or three-dimensional structures. The most important limitation in this kind of buildings is to check the instability of the structure. The lateral buckling is the phenomenon of instability that most worries in large spans (Wang, C.M. & Wang, C.Y., 2004).
On the other hand, the boundary conditions are a fundamental condition in terms of the behavior of a structure or structural element. This influence is magnified in the case of large span structures.
In fact, there are various methods to execute roller, pinned and fixed supports in the case of metal structures. The architect is responsible for designing and calculating the structures. Therefore, he makes project decisions regarding the design of the supports, waiting for a certain behavior, according to which he performs the calculations of the necessary sections (Simsek, 2016).
Here arises a question of difficult resolution: how to execute in the construction some boundary conditions supposed in the calculation, or what is the same, how to numerically simulate the boundary conditions for a certain real solution.
In this research work, the relationship between simulated and real boundary conditions for a truss model is evaluated, using computer tools to calculate structures and strain gauges on a real laboratory specimen.

2. Methodology

This paper delves into the complex boundary conditions and the monitoring of singular architectural structures of large spans. A sensitivity analysis of the boundary conditions have been carried out. A specific scale truss model has been used to deal with this question. With this purpose, laboratory tests and numerical simulations are carried out for the same specimen, results are compared and conclusions are drawn.

2.1. Geometry

Due to the difficulty of carrying out this study in a real constructed structure, the design and construction of a scale structure and its support are performed, in order to carry out laboratory tests and compare the results with computer simulations. The case of study is a flat truss designed with dimensions and material capable of making visible the effects of deflection and buckling, and making it possible to measure its internal stress and deflection.
The geometry of the assessed flat truss and its supports can be seen in Figure 1.

2.2. Scale laboratory specimen

A scale model with a very precise geometric definition has been built for the measurement of the real stresses and deflections.
The truss is made of aluminum, a material increasingly used in the construction sector, due to its lightness, mechanical strength and ductility. Specifically, the test truss is made of 5038 aluminum, an aluminum alloy, 4.5% magnesium and other elements such as manganese, iron and silicon.
The complete laboratory system consists of the flat truss, the support system, a loading device, strain gauges and a deflection measuring system (Figure 2). A loading device with extensometric and singular character is implemented, which allows the progressive loading of the structure.

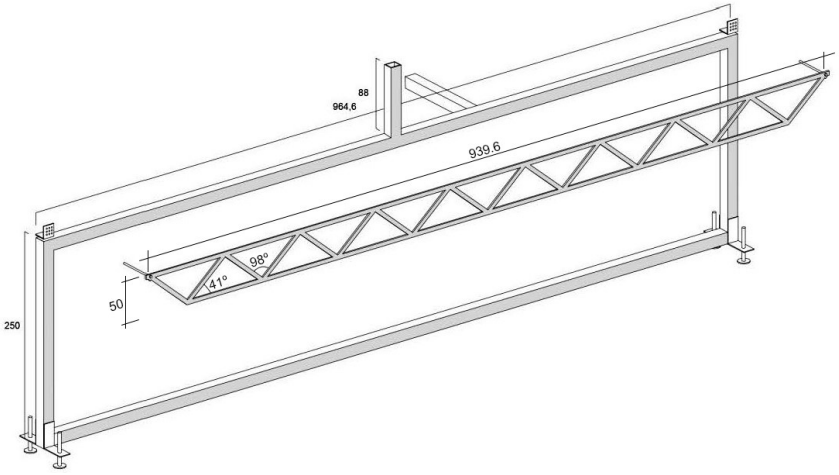

Figure 1. Geometric definition of the studied truss and supports. Source:Drawing by the authors.

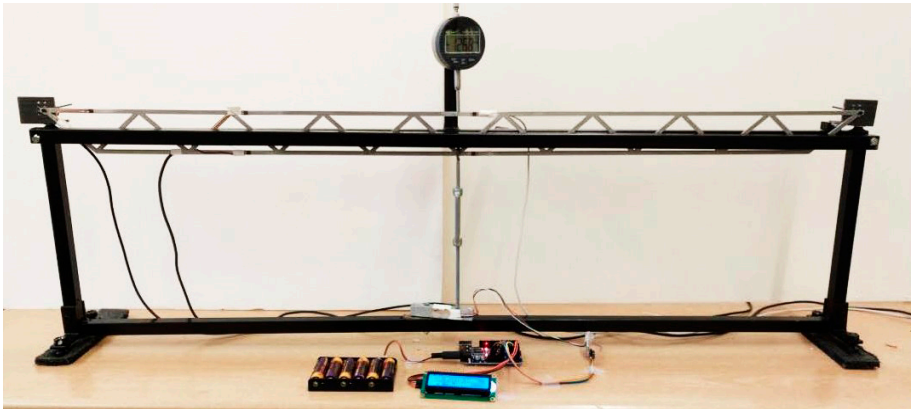

Figure 2. Laboratory specimen for real load test. Source:Drawing by the authors.

Through the loading device the truss is subjected to successive incremental loading steps. The measurement of the vertical deflection is done with a comparator clock as a measurement system. And the internal stresses and strains are measured by strain gauges connected to an Arduino microcontroller. The results are displayed on a LED screen.

The sensors have been calibrated with precision prior to the tests, which have been carried out with different load cycles, and load, stress, strain and deflection have been monitored. The operation of strain gauges is based on the change in electrical resistance that an integrated conductor filament assumes, being directly proportional to the deformation experienced by the solid to which they are attached. The measurement of these voltage differences is carried out by a symmetric arrangement of four equal resistances, called the Wheatstone

bridge. The gauge is implemented as one of the four resistors producing an imbalance that is responsible for digitizing a microcontroller (Manoranjani et al., 2015).

As stated above, it is very important to define the boundary conditions of the structure. The supports have been designed so that they adapt to the length of the truss. In this way it is achieved that the substructure does not apply initial tensions. The solution is based on two perforated angles with different holes. A pin, of the same diameter, is responsible for maintaining the truss in its position, without being able to move in any of the three directions. It only allows the rotation around it, in the axis perpendicular to the piece (Figure 3).

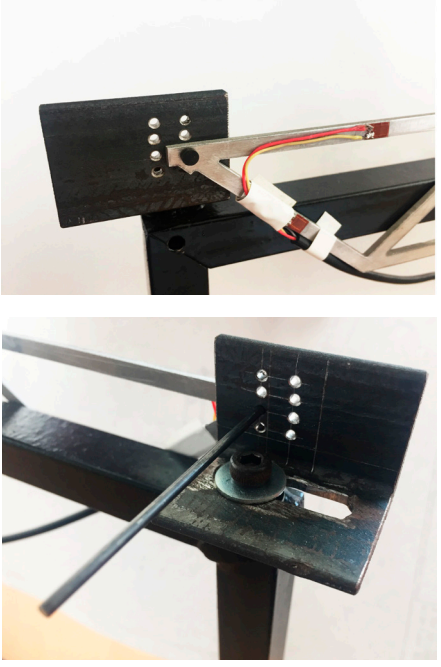

Figure 3. Pin at the laboratory specimen supports. Source:Drawing by the authors.

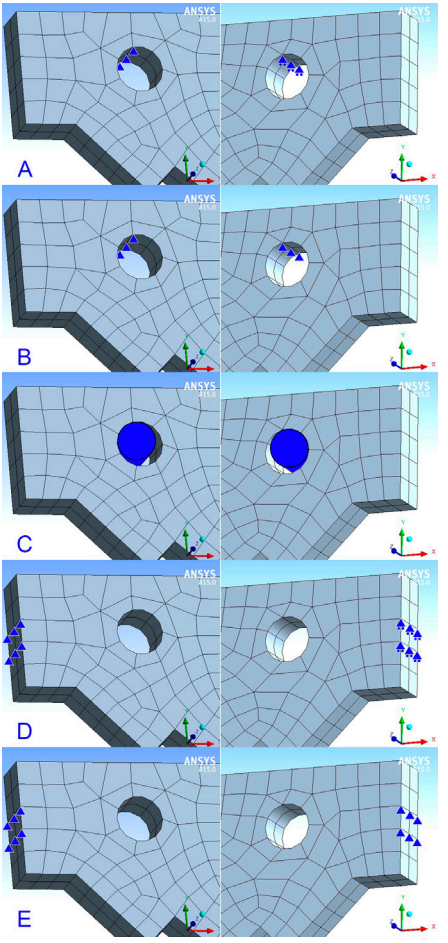

Figure 4. Boundary conditions applied at the ends of the simulated flat truss. Source:Drawing by the authors.

2.3. Numerical simulations

It is necessary to remember that the objective of this paper is to analyze the relationship between real boundary conditions and the different possibilities of numerical simulation. For this, a multiphysics calculation software is used, the Ansys Workbench (Ansys, 2012), where three-dimensional truss specimens with different boundary conditions are simulated so that they can experience the dangerous effect of lateral

buckling. The complexity of the finite element method is necessary for the assessment of the influence of very small variations in the boundary conditions, what could not be obtained with a structural bar idealization.

A mesh of finite elements of 1 mm on each side has been used, an appropriate dimension for the degree of precision required by this study. Five options of boundary conditions have been studied, in order to analyze which of them is closer to the actual boundary conditions of the laboratory specimen. The five options can be seen in Figure 4. All cases have restricted movement perpendicular to the truss (Z direction), and are supported vertically (Y direction). Some of them have a roller support in one of their ends in the X direction. Cases A and B have the boundary conditions applied in a line of nodes inside the hole. The case C consists of a Compression Only support, with what appears reaction when it compresses the pin by some zone. This should be the simulation closest to the laboratory test, because pins have been used. And the cases D and E have the boundary conditions applied in two lines of nodes at the ends of the trusses. This simulation would resemble the welds in the central third, commonly used to execute a pinned support in metallic structures.

3. Results

This paper does not show the totality of the results for all the cases and all the loads due to extension. Table 1 shows the results of stress (σ) and vertical deflection at midspan for the different applied loads (5, 10, 15, 25, 35 and 50 N), for the simulated case A (pinned-roller suports) and the laboratory test, as an example. The variation is scarce in terms of stresses, but it is significant in vertical deflection. This is because in the hypothetical case A there is a roller support, and in the laboratory model no end is allowed to slide.

	Theoretical case A (ANSYS)		Lab Test Strain gauges and Arduino			
Load at midspan (N)	σ (MPa)	Deflec. (mm)	σ (MPa)	Δ with Ansys	Deflec. (mm)	Δ with Ansys
5	2.73	0.12449	2.62	4%	0.10	20%
10	5.09	0.24698	5.02	1%	0.20	20%
15	7.42	0.37347	7.12	4%	0.29	27%
25	12.73	0.62245	11.45	10%	0.51	19%
35	16.94	0.87144	15.76	7%	0.73	17%
50	24.22	1.24490	23.14	4%	0.96	28%

Source: Table by the authors.

Table 1. Results of stress and midspan deflection for different load steps (theoretical case A vs laboratory test) and their variation.

	σ (MPa)	Δ with lab test	D (mm)	Δ with lab test	1st mode buckling factor
A	5.09	1%	0.247	24%	1.640
B	2.62	-48%	0.158	-21%	8.443
C	2.56	-49%	0.158	-21%	9.236
D	5.45	9%	0.258	29%	1.266
E	2.75	-45%	0.166	-17%	8.315

Source: Table made by the authors.

Table 2. Results of stress, midspan deflection and first mode buckling factor for different numerical simulations with 10 N load and their variation with regard to lab test.

Table 2 presents the stress and vertical deflection at midspan results for the simulated cases with 10 N load, for reasons of paper extension and to be able to draw conclusions. The variation in both stresses and deformations of each of the simulated cases is analyzed with respect to the real laboratory model. Figure 5 shows the results of stress, vertical deflection and the first two buckling modes obtained with Ansys Workbench for case A, as an example.

In addition to comparing the numerical results with the real results to evaluate the case that is closest to reality, it is intended to analyze the remaining safety in each case. Because the lateral buckling instability is the instability phenomenon that first appears, it has been decided to quantify the load necessary to reach this first buckling mode. Therefore, the last column of Table 2 shows the multiplier for the 10 N load necessary to reach the first buckling mode in each case. This value is a good estimate of the existing remaining safety.

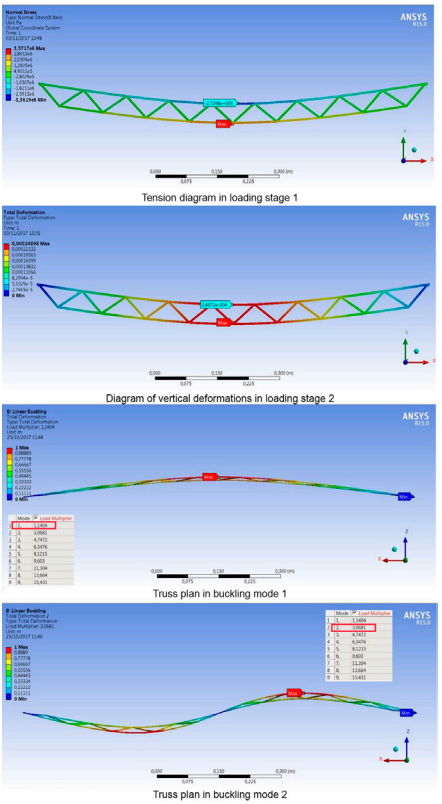

Figure 5. Stress, vertical deflection, 1st and 2nd buckling mode for A case with 10 N load. Source:Drawing by the authors.

4. Conclusions

The calibration of the criteria to define the behaviour of the boundary conditions to be imposed in the analysis methods is very important. It has been demonstrated that with small changes in the numerical simulation of the boundary conditions, important variations can appear in terms of stresses, deflections and residual safety. It is a fundamental task to perform a preliminary study of how the boundary conditions are going to be executed, in order to carry out simulations and calculations that assume a behavior that is closest to reality.
The small slack that exists for the pin in the hole in the scale laboratory model causes it to behave differently than expected, which would be like a compression only simulation (case C), since the real model has a pin at each end, which allows the rotation but not the displacements.
On the other hand, as far as buckling is concerned, it is better not to execute roller supports, although this may cause problems with thermal expansion.

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CHAPTER #5.14

DECODING NATURAL KINEMATICS FOR STRUCTURAL APPLICATIONS

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1. Introduction

Throughout history, architects have looked to nature for inspiration for building forms, and structural efficiency. The basis for a physically dynamic architecture that is supported by improved understanding of biological systems and scale in particular has been increasingly investigated in the last years. Adapting mechanisms and capabilities from nature led among others to effective materials, structures, and mechanisms (Kolarevic & Parlac 2015).

Kinetic systems of rigid members have been mainly studied in terms of deployable structures (Pellegrino, 2001). Tensegrity systems, i.e. self-stressed systems composed of tension and compression members (Pugh, 1976), have certain analogies in their structural composition as to the biomechanics of the human body. The systems may be transformed from a closed configuration to a predetermined expanded form, in which they are stable and can carry loads, through alteration of the compression or tension members' length (Hanaor, 1998).

Flexible motion principles have been so far transferred to architecture following plant movement principles that have been scaled-up and integrated in lighter and less complex bio-inspired kinetic elements. In particular, global flexibility is often achieved through the versatile behavior of locally differentiated regions with special morphological features that act as living hinges and allow for large elastic deformations (Schleicher et.al., 2015). In this frame, elastically deformable members may act as primary components in hybrid structures with enhanced capabilities in their kinematics, due to their controllable elastic deformations, while preserving geometrical reversibility in achieving different configurational transitions (Lienhard, 2014). This behavior offers potential new forms of flexibility, adaptability and deformation using the memory effect in structural members (Phocas & Alexandrou, 2017).

Kinetic structural systems have been so far industrialized, to accommodate fundamental construction principles applied in architecture. Along these lines, the hard-mechanical approach often prioritizes uniformity, regularity, and compatibility over individuality and adaptability. As a result, mechanical devices are usually conceptualized as mono-functional and standardized modules, whose mechanics conform to a grid of orthogonal axes. Here, adaptation can only be achieved at the expense of additional mechanical complexity, which results in heavy and maintenance-intensive structures. On the other side, the soft-mechanical approach has been in most cases applied on the basis of the top-down approach, i.e. with the aim to convey adaptive characteristics to respective structural typologies of flexible members based on natural principles of operation.

In reflecting on the above considerations, in the present paper, the jellyfish kinematics is interpreted and applied at a conceptual structure level. In the following section, the example of the soft natural kinematics is briefly presented and typologically decoded. Subsequently, a related design application in architecture/structure context clarifies implementation issues. In the last section of the paper, general conclusions are drawn.

2. Soft Natural Kinematics

Biomimetics, also synonymous with 'biomimesis', 'biomimicry', 'bionics', 'biognosis', 'biologically inspired design' etc. implies copying or adaptation or derivation from biology (Vincent et al., 2006). Recently, a definition of biomimetics is developed in ISO 18458, 2015: 'interdisciplinary cooperation of biology and technology or other fields of innovation with

the goal of solving practical problems through the abstraction, transfer, and application of knowledge gained from biological systems'. Although this definition primarily highlights the fundamental steps in knowledge transfer, at the same time, an investigation of natural structures and their behavior, provides clarification of their respective function, which may be a result of related forms, processes and interactions (Jacobs, 2014). In the present paper, the term biomimetic design is used to characterize the transfer of natural organisms motion in the conceptual design of structures in architecture based on respective patterns and technological interpretation principles. In this respect the design approach followed consists of three stages: research/observation, abstraction and conceptual development/application.

It is well acknowledged that dynamic structural forms derived from nature and their relation to the mechanics of moving fluids can lead to highly effective kinematics. The kinematics of jellyfish relate to a bio-pulse mechanism example in nature, Fig. 1. Jellyfish acquires a thrust force almost by pumping movement, however, it possesses a complex movement pattern and appearance because of its delicate body structure (Kinchen, 2009). It squeezes its body to push water from the bottom. The displaced water creates a vortex. This propels it through the water. Jellyfish pauses in-between contractions, so that the vortex accelerates the moving distance with each contraction. Rather than moving continuously through water while swimming, jellyfish uses a critical pause between the radial contraction and expansion of its bell-shaped body to create a vortex ring in water, that pushes it forward. Muscles are used for the contraction of the body, which sheds the first vortex and pushes the animal forward; the body mechanism is so elastic that the expansion is powered exclusively by relaxing the bell, which releases the energy stored from the contraction. By doing so, a second vortex ring rolls under its body and it begins to spin faster. It then refills the bell and is pushed up against the centre of the body, giving it a secondary and 'free' boost forward. The mechanism, called passive energy recapture, only works at low speeds and relatively small body sizes, allowing jellyfish to travel 30 % further on each swimming cycle.

The jellyfish propulsive mechanism has enabled the development of models describing associated kinematics and dynamics (Dabiri and Gharib, 2003). A determination of the motion pattern, based on the principle that swimming thrust is produced by the flux of fluid movement from the bell during the contraction

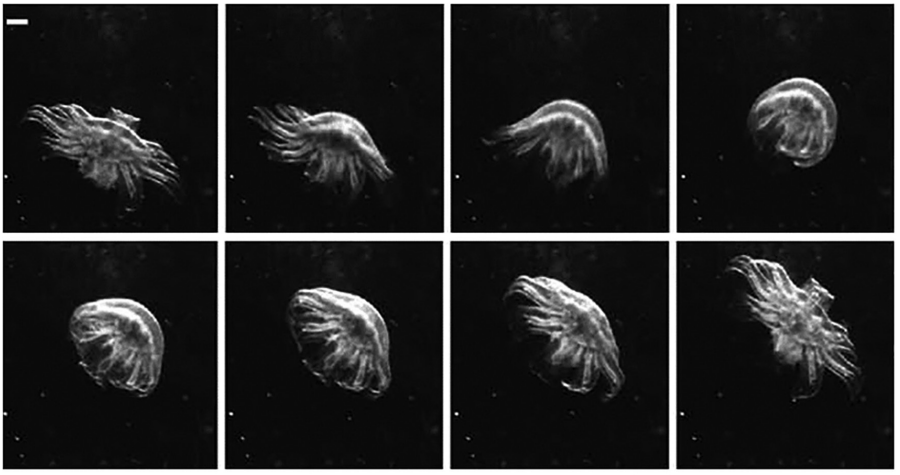

Figure 1. Jellyfish Kinematics.

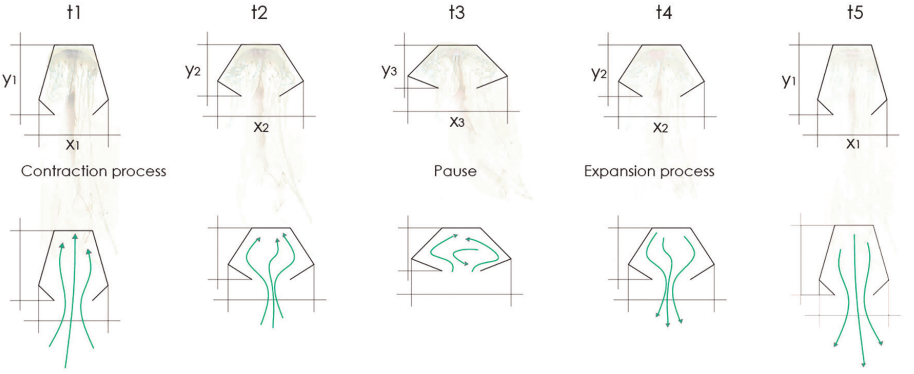

Figure 2. Jellyfish movement principles.

phase of each propulsive cycle, is presented in (Daniel, 1983). Further studies of kinematics and dynamics have relied primarily on empirical data and observations made that highlighted the importance of symmetric and complete bell contraction of jellyfish (Nawroth et al., 2012). Even if, in contrary to hydrodynamics, in aerodynamics the gravity effects are mainly not considered, the study of jellyfish motion in water, further provided the expansion and contraction kinematic principles to be implemented at conceptual structure level. The related kinematics is presented in simplified form in Figure 2.

3. Architectural Application

The jellyfish movement has been typologically implemented in a kinetic core mechanism of a conceptual design of a high-rise steel structure with an outrigger system of truss diagonals and vertical pretensioned cables at the outer perimeter, Fig. 3. The kinetic core mechanism design proposes vertical PETG (polyethylene terephthalate glycol) lamellas interconnected with prestressed ETFE (ethylene tetrafluoroethylene) membranes, in utilizing the elements elastic residual capacity in bending, stretching and buckling to generate motion.

The structure's core morphology investigation was based on basic principles of aerodynamics, and the variation of the inner space diameter, for increase of the air velocity and avoidance of turbulence effects. The kinematics of jellyfish interpretation and respective transfer for the high-rise core morphology development aim at an increase of the impulse of the airflow over the

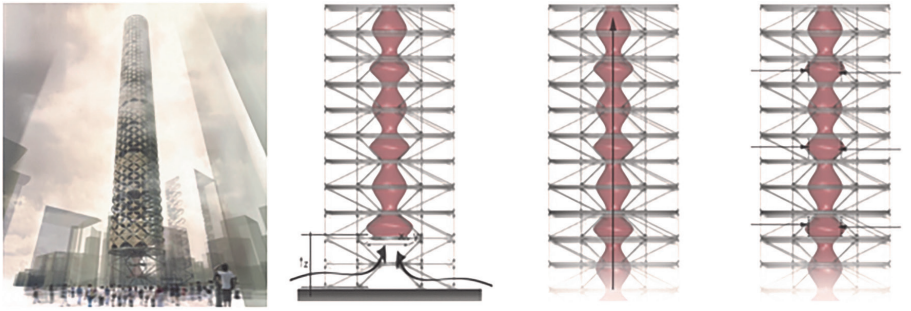

Figure 3. High-Rise Building and vertical air ventilation concept of the core.

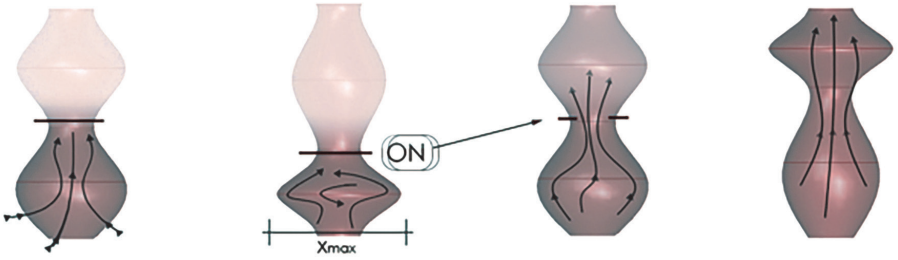

Figure 4. Kinematic mechanism: Bubbles unit tranformability.

height. Following the principle of jellyfish's radial contraction and expansion in order to achieve the impulse required, the surface elements of the mechanism are contracted and expanded for the required impulse development of the airflow. The mechanism units are divided in pairs of 'bubbles'. In a contraction bubble, incoming air is enclosed and temporarily stored. In an expansion bubble, the stored air is vertically channeled. The contraction process of the air suction bubble induces expansion of the subsequent bubble, i.e. inverse structural transformation, so that the air is further channelled in the inside, Fig. 4. Both bubbles act proportionally inversely. The surfaces are placed between three ring members. The ring members on both edges have constant diameter and absolute position, the middle one varies its position on the vertical axis, so that the process of transformation of each element during contraction and expansion is preserved (Phocas et.al., 2017).

4. Conclusions

In architecture, kinematics have been realised so far, primarily based on a hard-mechanical approach, lacking often real flexibility with regard to the system's spatial transformability, mechanical simplicity and energy efficiency. Considerable improvements in these aspects may be achieved through a soft-mechanical approach, whereas biomimetic design comprises the driving mode of operation in interdisciplinary research and design environments. An investigation, abstraction and application of respective functional principles available in nature may well provide fundamental principles in the design of kinetic structures in architecture. Following a brief presentation of related hard and soft mechanical approach principles, the jellyfish movement pattern has been typologically decoded and implemented in a conceptual structure design of a high-rise airflow structural concept. The jellyfish movement pattern provided the kinematics of units of transformable bubble pairs arranged vertically within the structures core. The bubbles consist of bending-active members interconnected with prestressed membranes and ring members. Utilization of the elastic material properties of the members enables sequential motions through contraction and expansion of the bubbles in support of the vertical airflow. Thus, the kinetic design case study presented aims at achieving improved performance of the vertical core air ventilation system for high-rise buildings.

In the present paper, the analogy of soft natural kinematics to the architectural application takes only place at a typological level, since the former rather serves as inspiration for the respective conceptual structure mechanism development. Detailed studies on aerodynamics and the scale of the structural members applied, in terms of airflow, turbulences and boundary layer phenomena, and material, simulated through linear PETG lamellas interconnected with ETFE membranes, are certainly further required to estimate the effectiveness of the concept and its advantages compared to standard air-flow generating devices.

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6

BLOCK 6: THEORY AND CRITICISM IN ARCHITECTURE

INTRODUCTION TO BLOCK 6

THEORY AND CRITICISM IN ARCHITECTURE. ARE THEY STILL RELEVANT TODAY?

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The role that theory and criticism have played in Western architecture has been changing along different periods of history. Up until the 19th century, while the discussion on architectural styles and historicism was still in force, theory had a definite ruling role in architecture, in so far as the language and grammar based on classical orders and principles, or in the canons of the picturesque, were a key element in the design and appreciation of buildings. Once hegemonic modernism sentenced history to oblivion, theory and criticism seemed to be devoid of their former historical authority, having to rely on the legitimizing power of manifestos and statements issued by the different currents of modernism and their leading voices. Now that modernism was declared defunct more than 40 years ago, and in the age of globalization, the discourse focuses in the ability of 'localization' of the wider process of modernization, incorporating another perspectives affecting the spheres of geography, culture, gender and society, among others.

The variety of phenomena that, consequently, become subject of attention of theorists and critics is overwhelming, and their perspective is kaleidoscopic such as the selection of papers in this section shows. For this reason, we consider that the debate requires of a certain return to basics, or to principles, discarding a simplification of the discourse. Vitruvius, an author whose Fano Basilica is dissected in one of the selected papers, must have had a feeling of one the great challenges of architecture forever, when he talked about *utilitas, firmitas* and *venustas* as key issues to understand and make architecture. Indeed, the idea of architecture as an integrating synthesis of conditioning factors, and architectural value as the degree of success in the fulfilment of that synthesis, has defied architects of all times, and still is a crucial reference to understand and appreciate the best pieces of architecture.

The chapter by Iborra and Baro on the restitution of the tribunal in the Basillica of Fano shows how despite the prevalence of the rule or canon, the existence of the work of architecture is completely autonomous, and relies in the role played by historical documentary sources and their interpretation for the research of the architectural heritage. The ability of the researcher to question and frame these historical sources within different backgrounds, and to relate them to the logic brought up by the different aspects affecting a historical work of architecture can cast new light on previous knowledge.

Theory and criticism in architecture today still have much to say about the value of the architectural work through the driving processes leading to the synthesis of aspects that account for and explain its form: the place, the use, the society, the cultural context, the constructive and structural technologies and materials, geometry, visual perception, motion, space, scale, etc. To value an architect is to value the designer's ability to integrate the highest amount of conditioning or interrelating factors, which will surely enrich the sense of his or her works, as long as their presence can be perceived in the final form. Since a design process is an open-ended iterative search for an overall best balance of often conflicting needs, the aesthetic value and wealth of meaning of the built work largely relies on the ability to integrate in its form the highest amount of these conditioning factors: environmental, functional, structural, morphological, visual, etc.

The chapter by Onen, entitled "Towards a humble architecture: ambiguity, inevitability, and the search for a unified form", addresses how the 'permanent' issues in the theory and criticism of architecture; form, order

and beauty, seem to have been overcome by other more contemporary topics, but, as the author argues, "the architect's quest for order remains as an invariable regardless of time and place". This desire is shared by artists of other artistic disciplines, and points out a common ground between architecture and the arts, with similar concepts that encourage interaction and become a rich source of inspiration. Complementing this vision, the relationship between architecture and place is discussed by Enia in the chapter on 'hiding architecture', which delves into different strategies such as camouflage, anonymity and minimization; in close relationship to how Aparicio and Ruiz rise the topic of phenomenology in the study of Zumthor's atmospheres, as well as materiality, its perception, and the emotions aroused by them, in one of his most relevant and challenging, yet modest, heritage interventions.

Several of these aspects raise the issue of the role of architecture in society. The star system is difficult to maintain in a society striving for justice and peace for all. The role society is demanding architects is not so much as art stars, as public servants. Architects are expected to play a guiding or a coordinating role in the relationship between people and their environment. There is an increasingly urgent need to improve and strengthen the links between architects and all the active agents in the shaping, protection and improvement of the built environment: local communities, local authorities, politicians, developers, builders, estate agents, manufacturers, etc. This incorporates an enhanced vision on uses of space, the right to the city and gender, which have become central to the architectural discourse. In this sense, the chapter by Guimarães and Fontenele, 'Framing gender', proposes how to address the demand to account for the everyday needs of many different groups of people: men, women, children, youngsters, handicapped or elderly people, which do not quite seem to fit within the standard approach to architectural design.

This sets an important contrast with the rigid framework of modernism, with which some chapters in this block deal in different times and contexts. For example, the chapter by Alaoui on modern architecture in Casablanca, and the housing schemes developed for the local population, brings up topics like colonial modern architecture, interaction between different cultures, architecture as an expression of power, or the relationship between vernacular and modern architecture. It evokes other similar cases, such as Chandigarh, and the implementation of the concept of mat-building by French architects like Michel Ecochard.

The conflictive assimilation of modernism in non-Western societies poses a difficult question; not as it was formulated by Docomomo in 2006; 'Other Modernisms', but rather as the conflictive clash with the 'Modernism of the Others'. The chapter by Banci on Ankara in the 1950s and the role of journals in architectural criticism, reflects on this. In this case focus is placed on the task carried out by the French journal *L'Architecture d'aujourd'hui* in the dissemination of modern architecture in Turkey. Another case of interaction between different cultural backgrounds, between the universal principles of modern architecture, brought by a French institution, and the local conditions of traditional Turkish architecture.

Last but not least, Christopher Alexander's patterns prove their validity in today's architectural thinking, as they are once again invoked in the chapter by Poyatos et al., and invite us to trace Alexander's subsequent theoretical production with the four volumes published in the first decade of the twenty first century under the common title *The Nature of Order: An Essay on the Art of Building and the Nature of the Universe:* 1. *The Phenomenon of Life*, 2. *The Process of Creating Life*, 3. *A Vision of a Living World*, and 4. *The Luminous Ground*. An architecture more focused on human behaviour and needs, and more linked with life and nature is the common claim underlying this theoretical thought.

All the aspects that make up the architectural synthesis are relevant for the theory and criticism of architecture. History has proved that there is no point in trying to state universal laws for architecture. As Gaudí pointed out, to study science you need to know its laws, to study art you need to study outstanding examples.

CHAPTER #6.01

THE PROBLEM OF THE TRIBUNAL IN THE BASILICA OF FANO

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1. Introduction

At present, it is relatively easy to locate a translation of the Vitruvian text into any of the main European languages. In Spain, for example, we usually handle the extraordinary edition by José Ortiz y Sanz (1787), which, despite containing some errors, remains true to the original text and introduces erudite philological comments and archaeological observations to justify it. The passage relating to the tribunal within the Basilica of Fano is as follows:

[...] The columns are: on the breadth of the main roof at each end, four, including the corner columns at right and left; on the long side which is next to the forum, eight, including the same corner columns; on the other side, six, including the corner columns. This is because the two middle columns on that side are omitted, in order not to obstruct the view of the pronaos of the temple of Augustus (which is built at the middle of the side wall of the basilica, facing the middle of the forum and the temple of Jupiter) and also the tribunal which is in the former temple, shaped as a hemicycle whose curvature is less than a semicircle.
The open side of this hemicycle is forty-six feet along the front, and its curvature inwards is fifteen feet, so that those who are standing before the magistrates may not be in the way of the business men in the basilica. Round about, above the columns, are placed the architraves, consisting of three two-foot timbers fastened together. These return from the columns which stand third on the inner side to the antae which project from the pronaos, and which touch the edges of the hemicycle at right and left (Morgan 1914: 135-136).

We should take into account, however, that it is a translation of a text originally in Latin, including multiple Greek terms, with sentences structured in a very different way and without punctuation marks. That is why it is necessary to go to the primary sources, because certain expressions may have ambiguous interpretations.

2. The tribunal in the historical restitutions of the Basilica of Fano

2.1. The tribunal at the end of the nave: Fra' Giocondo (1511) and Sangallo (1536)

The first illustrated edition of Vitruvius's treatise would be the one by Fra' Giocondo da Verona (1433-1515), published in Venice in 1511. The Latin text is accompanied by very schematic drawings. The Basilica of Fano is characterized as a rectangular building, with apse in its extreme, as the Christian religious buildings, but with a peristyle surrounding the whole structure and, separately, the Temple of Augustus.
A similar solution, although with the colonnade placed indoors, was described by Giovan Battista da Sangallo (1496-1548) in a drawing of his own hand, made circa 1536 on a Sulpician edition of the Vitruvius's treatise. Although it consists in a totally arbitrary interpretation of the Vitruvian text, it is curious to observe the similarity of this proposal with some Roman basilicas, already dated in the second century, such as Trajan's in Rome, or those in Volubilis or Leptis Magna.

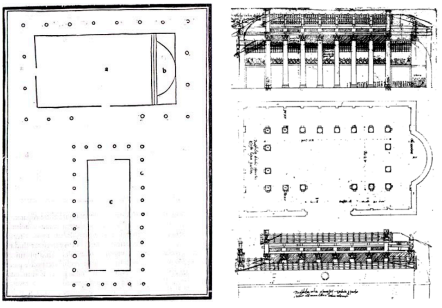


Figure 1. Plan of the Basilica of Fano, after Fra' Giocondo (1511) and Giovan Battista da Sangallo (1536).

2.2. The tribunal on one side of the nave: Cesariano (1521) and Di Lüttichau (1934)

The heterodox solution of the basilica with the tribunal at one of its extremes would soon be overcome, keeping the idea of an apsidal form, but locating it in the middle of one of the long fronts of the building. The first to raise this idea was Cesare Cesariano in his illustrated edition of the Vitruvian text (1521). Typologically, this proposal could be supported by such notable examples as the Basilica of Maxentius. On the other hand, the references of Vitruvius to the hemicycle of the tribunal and to the fact that the architraves touched this hemicycle, seem to endorse an apse form.

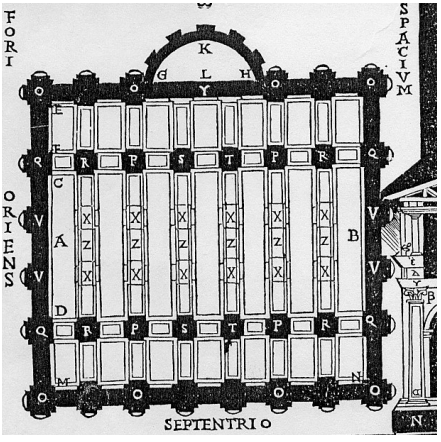
It is strange to verify that this hypothesis has not received any more acceptance, although we can imagine that the connection of the Temple of Augustus seems incompatible with a semicircular contour. In fact, it was not until the twentieth century when it returns, in parallel to the disappearance of the Temple of Augustus in modern restitutions.

Among the alternatives of this disposition, the one stated by Di Lüttichau (1934) has special interest, as he proposed the existence of two concentric hemicycles, the inner of those would serve as tribunal proper, and the exterior corresponding to the Temple of Augustus, understood rather as a sanctuary incorporated within the apse itself. This hypothesis was retaken by Paolo Clini (2014) in his proposal of 1996, and this is the one that we include below.

2.3. The tribunal inside the temple: Palladio (1556), Perrault (1673) and Galiani (1758)

Among the reconstructions of the Basilica of Fano, one of the most successful proposals is the one by Andrea Palladio and Daniele Barbaro for the Vitruvian edition of 1556. Assuming the complexity of the primitive text and the references to the *pronaos* of the Temple of Augustus, closely related to the Basilica, it was interpreted that the tribunal was inside the aforementioned temple. The direct reading of the original Vitruvian passage indicates unequivocally that the tribunal was in the *pronaos*, but for the first Renaissance scholars perhaps it was more convincing to think of an orthodox solution of a classical temple and a mistake in the original text expression. Perrault (1673) assumed the Palladio's plan with minimal differences, Viviani (1830) copied Perrault in turn, and Galiani (1758) removed the columns from the temple front . He was the first trying to restore the Forum as a whole.

This solution does not fit with the actual description of the Basilica of Fano, although it responds typologically to certain temples with apsed *cella*. In fact, the rigor of setting the temple within a conventional typology leads to propose a *pronaos* of a prostyle or pseudoperipteral temple, with lateral openings.



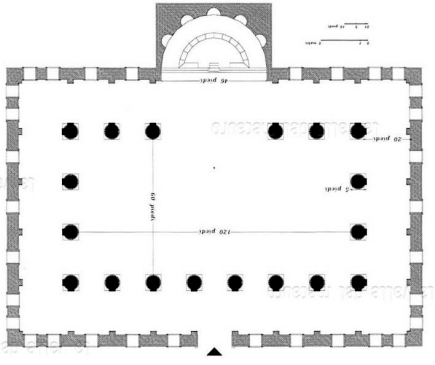


Figure 2. Plan of the Basilica of Fano, after Fra' Giocondo (1511) and Di Lüttichau / Clini (1934/1996).

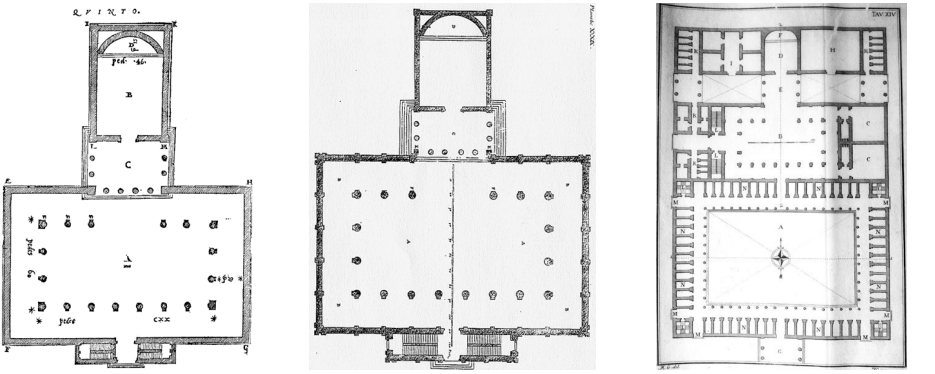


Figure 3. Plan of the Basilica of Fano, after Palladio (1556), Perrault (1673) and Galiani (1758).

2.4. The antae appear: Orsini (1802), Amati (1829) and Viollet-le-Duc (1863)

One more step towards the comprehension of the Basilica of Fano took place in the 19th century, when the mention of the *antae* included in the original text began to be taken into account. That is to say, the sides of the *pronaos* were not open yet, but closed by lateral walls as usual in the so-called temples "In Antis". The first to assimilate this idea seems to be Orsini (1802), whose plan is also characterized by the apse dimension, that does not occupy the entire width of the temple, forcing it to suppress two pairs of columns in the basilica zone.

The restitution of Amati (1829) also includes the whole Forum. Regarding the basilica, it bears a strong resemblance to that of Galiani, although he introduces the Temple of Jupiter in front of the basilica and arranges the *pronaos* of the Temple of Augustus with *antae* and two columns between them. The tribunal is similar to that of Galiani, related in turn with the proposals derived from Palladio.Viollet-le-Duc (1863) is probably the most notable exponent of this group. His plan has some bearing on that of Orsini, although the width of the temple does not surpass that of the apse. His main contribution consist of placing the staircases attached to the temple instead of against the basilica front façade, as Palladio proposed. We must consider that this simple plan had the sole purpose of accompanying his interesting constructive restitution of the building published in the *Entretiens*, being more than likely that he assumed directly the Orsini proposal without a typological reflection.

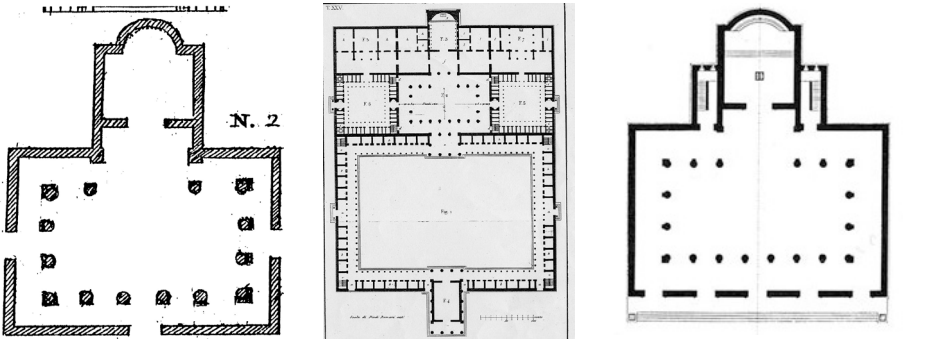


Figure 4. Plan of the Basilica of Fano, after Orsini (1802), Amati (1829) and Viollet-le-Duc (1863).

2.5. The tribunal returns to pronaos: Zestermann (1847), Reber (1865) and Morgan (1914)

The great contribution of the Germanic bibliography lies in the return of the tribunal to the *pronaos* of the temple and the interpretation of the Vitruvian "hemicycle", not as an architectural form in itself, but as a simple seat or bench. Zestermann (1847) was the first to propose this solution in his monographic study of the Roman basilicas, which was later renewed by Reber (1865) in his own edition of the Vitruvius's treatise. In our opinion, this is the most coherent interpretation with both the original Latin text and the understanding of the Roman archaeology, with very similar documented examples such as the Basilica of Sepino (David 1983: 231-232). A variant of this model is the one proposed by Morgan (1914), who arbitrarily substitutes the front wall of the *cella* by two columns in order to allow the vision of the statue of Augustus from the interior of the Basilica.

2.6. The temple disappears: Prestel (1901), Ohr (1975) and Peters (1997)

The position of the tribunal in the *pronaos* or vestibule of the temple seems to create some difficulties of functional type, because the seats of the hemicycle are interrupting a suitable access for the cult. That is the reason for which Prestel (1901) proposed a temple opened by the opposite front. In his restitution, he still introduces two connecting doors of a secondary nature between both spaces. The most successful hypothesis in recent times is the one of Ohr (1975) -followed by others of authors such as Peters (1999)- who chooses to avoid the problem, assuming a rectangular tribunal with a semicircular bench (which Peters omits). This solution could be inspired by the archaeological findings of many Roman basilicas of that time, such as those of Cosa and Ordona (David 1983), which bear great similarities in other aspects with the Vitruvian description of Fano.

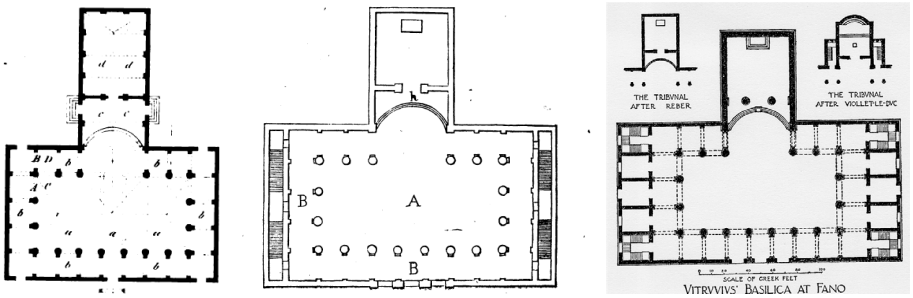


Figure 5. Plan of the Basilica of Fano, after Zestermann (1847), Reber (1865) and Morgan (1914).

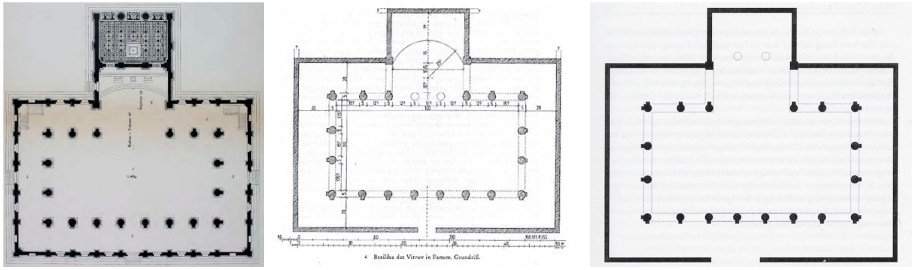


Figure 6. Plan of the Basilica of Fano, after Prestel (1901), Ohr (1975) and Peters (1997).

3. Conclusions

As it has been verified, the tribunal has been the most controversial element in the historical restitutions of the Basilica of Fano. If we had to choose one of them, we would opt for the hypothesis of Reber (1865) which, in our opinion, is the one that best interprets the original Vitruvian text and its archaeological analogies.

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CHAPTER #6.02

ECOCHARD'S HOUSING GRID, THE REBIRTH OF MODERN ARCHITECTURE IN CASABLANCA

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1. Introduction

Casablanca is a recent city, mostly composed of 20th century urban and architectural experiments developed by the French protectorate (1912-1956) in order to export successful principles. Anfa, Casablanca's former appellation, has grown considerably since Hubert Lyautey, the first general resident of the French protectorate. Lyautey chose Casablanca as the main port of Morocco and designated the city as the economical capital of the country. The increasing urban density in Casablanca has been a major issue for architects and urban planners for over three decades. Between 1926 and 1947 the population has increased by 10% every year due to industrialisation. The growth of urban areas during the protectorate created an salient gap between the urban and rural part of Morocco.It is during this period that Michel Ecochard arrived in Casablanca in 1946. At the time, the city was an architectural laboratory to experiment new regulations and concepts. The urban planner, who worked previously in Syria, developed revolutionary ideas and practices in Morocco. In terms of urban planning and architecture, Ecochard's work has found an echo in the International Congress of Modern Architecture (hereinafter refered to as CIAM), which resumed in 1947 (Eleb and Cohen, 1998). In order to elaborate on the aforestated topics, the author has conducted fieldwork in July 2017. Four urban assembles buildings were visited, three of which in Hay Mohammadi (Semiramis, Nid d'Abeilles, edifices of the citéhorizontale ensemble and the cité vertical de sidi Othmane). Hence, the present paper is organised to fulfil the above-mentioned aims. It is divided into six sections as detailed below. The first section provides the urban historical background of the city and the projects necessary for the present study. The subsequent section outlines the reasons leading to the elaboration of the mass-housing buildings conception. The third section explains the various aspects of the design process carried out by Ecochard's team as well as their uses of the 8x8 grid. The fourth section highlights the impact of the innovative design at an international level. In section five, the author discusses current practice regarding the theories developed by modernist architects. The author concludes this paper by putting the architectural and urban approach in its contemporary local and global context.

2. The genesis

On April 17th, 1947, Michel Ecochard was appointed head of the newly created urbanism and architecture department commissioned by the General Resident EirikLabonne (Ecochard, 1955). This section outlines various underlying reasons that led him to experiment new mass housing principles between 1946 and 1952 in Morocco.

2.1. The rural exodus

The city was divided into two parts, the medina and the ville nouvelle. Access to the latter was denied to the majority of Muslims (Eleb, 2010). The city's attraction caused the "influx of Moroccan labourers from the surrounding hinterland to the booming industrial city" (Gunz, 2015, p. 262). The medina was congested and could not accommodate the new arrivals. As a result, the first bidonville appeared in the 1930s in the suburbs (Ecochard, 1955). The population increase has been both an opportunity and a challenge for many modernist urban planners and architects. Because of this demographic factor, the housing department had considered the eventuality of accommodating Muslims in multiple dwellings. Therefore the architects and urban planners stated studying and incorporating local practices to their design.

2.2. The influences

The Housing department had the purpose of creating a viable habitat for the migrant residents of shantytowns, 40% of whom came from the Atlas Mountains, according to the Department's studies. To provide a suitable solution, the new architects started seeking inspiration in rural human settlements, especially the Kasbahs, as opposed to the previous architects who were exclusively inspired by urban dwelling. The design process was based on a number of studies on the working class lifestyle (c.f. Montagne (1952) and Adam 1968). The elaboration of an adapted habitat was based on ground rules identified by these studies on the habits, the regions and the religion of these main groups. Traditional Moroccan urban and architectural features were studied in order to understand and build a similar type of dwelling for the Muslim population. Notable aspects of the medina were developed, especially grids and structures. The edifices are built next to each other; therefore, the medina is very dense, compact and well organised. The roads'size depends on their function. Larger roads are crossed many times, as opposed to narrower dead-end alleyways that lead to a cluster of residences. The Moroccan house, called dar, is characterized by specific architectural components. In his manuscript, Gallotti (1926) details its characteristics and proportions. By way of illustration, the rooms and their openings are organised around the patio, which is the central courtyard. Indeed, the reference to local architecture was not any more about decoration and ornamentation, but instead it was about organisation and structure.

2.3. Ecochard's proposal

The protectorate's ambition was to create an adapted habitat for the local dwellers at the time when individual houses were considered the only viable option for the Muslim population. Ecochard, hence, expended the original concept of adapted dwelling for Muslims by reflecting on new solutions, such as collective building for 'the greatest number' consisting of the "the poor, the working people in shantytowns and rural people" (Eleb, 2010, p. 155). They originally designed them to encourage the Muslim population to progressively adopt an urban lifestyle based on local traditional customs. Ecochard's experimentations were based not only on previous works, but also on personal observations and analysis of the new medina. These particularities are consistent with modernist principles. Jelidi (2009) claimed that the edifices followed major simple rules, defined by the Athens charter: sustainability of the economy, orientation... The next section will demonstrates how the tools used to design the patterns governing the modern mass housing project designed for Muslims were revolutionary at the time.

3. The revolution

A tabula rasa condition and favourable circumstances of French hegemony gave birth to modern edifices influenced by local restrictions. Indeed, several influential ideas were developed by the urban planners in order to overcome financial and social difficulties. The most symbolic one was the 8 x 8 meter grid also called the sanitary grid. This section draws on this aspect of the urban planners' and architects' work.

3.1. The team

The Housing Department adopted Ecochard's projects and commissioned young architects to work jointly with him. The early career architects collaboratively founded the Group of Modern Moroccan Architects (hereinafter refered to as GAMMA), and became full members of the CIAM following the Hoddesdon Congress (1951). Since 1944, Ecochard started to adopt functionalist theories of Le Corbusier (Eleb and Cohen, 1998). As a result, ATBAT Afrique was created, in which Woods, Candilis and many renowned modern architects took part. It was the name of the local part of the studio l'ATelier des BATisseur, founded in 1947 by Le Corbusier, Bodiansky, Wogensky and Py. The recent history of architecture has known fluctuation. Modern edifices in Casablanca are the reflection of international debates. Three different camps, within the ATBAT Afrique team, have emerged: Lods's partisans, Le

Corbusier's followers and Ecochard's young recruits. For example, Bodiansky embraced Lods's ideas, while Candilis was influenced by Le Corbusier's point of view. These opposite opinions were embodied in Morocco and could reveal the lack of collaboration within the team whose members separately submitted their propositions to the CIAM congress. Despite the differences of opinions, the team managed to agree on the use of a structural tool; Ecochard's grid became a basis for the young architects conceptions.

3.2. The tool

GAMMA's work had an international resonance. One of the main reasons for its success was the renowned 8x8 meter grid. Using this tool, Ecochard and his team were able to generate a variety of city components. Indeed, the gird allowed them to design mass-housing ensembles in addition to the transportation system structuring the city. "The grid provided both technical and functional integration, and its standardization determines both the shape of the city and that of its buildings" (Vanlaethem, 2015, p. 87). In fact, it was its structural grid that constrains the built surface. The initial intention was to tighten the dwelling. The minimum admissible was an 8x8 grid, the total surface of 64m2, which allowed building a habitat that included two normal sized rooms. The aim was to accommodate up to 350 persons per acre (Cohen and Eleb, 1998). It was also applied to gradually equip every 'minimum habitat cells' with roads, water supplies and sewers and organize anarchic dwelling such as shantytowns without relocating their inhabitants.

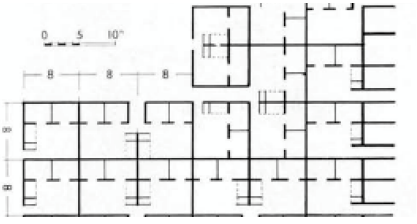

Figure 1. Floor plan of the "cite horizontale" (Ecochard,1955).

3.3. The application

Basing their design on the 8x8, Candilis and Woods have constructed the Semiramis building in 1953, near the Cite horizontale. They simultaneously built Nid d'Abeille, which was meant for a less religious and conservative population. Both buildings used to belong to the 'Compagnie Immobiliere et Fonciere Marocaine', just as the Cite horizontale did. They included traditional features, such as the reinterpreted patio functioning as a family space and fulfilling the gathering function (Eleb and Cohen, 1998). It was internationally exposed by the emblematic magazine L'Architecture d'Aujourd'hui on December 1st, 1954. A further instance of vertical ensembles, built using the emblematic tool, is the cité vertical De Sidi Othman, financed by the 'Groupement Foncier Marocain'. The architects Hentsch and Studer built it in two phases: in 1953 and in 1955. It is a concrete application of GAMMA modernist theories on Moroccan territory. Whether or not these amendments had an impact internationally is a matter that will be tackled in the next section.

4. The renewal

The adaptation to the local context as developed by Ecochard's team is opposed to one of the main ideas valorised by the modern movement: universality. At the time, modern architecture was at its apogee as a unique model spreading around the globe. This section argues on the validity of the modernist experience in Casablanca based on diverse factors, such as the design process, the cultural crossbreeding and the influences of the global as well as the local context.

4.1. The innovation

The consideration of local habits of shantytown residents represented a new stage for the collective thinking as highlighted by the CIAM. Their contribution to the 1953 Aix en Provence Congress congregated other similar opinions on the distinctiveness and the uniqueness of the urban habitat. During this congress, the team convinced a panel of modernists that the need to take into account the adaptable criteria

has become an important part of the design process. In accordance with a project for the Charter of Habitat in the early 1950s based on the Athens Charter, they view architecture as a way to gradually allow people to embrace a modern lifestyle and uses comfort to encourage specific physical, cultural and social behaviour (Casciato and Avermaete, 2013). So, the ATBAT's work illustrated the principles and the intentions developed during this experimental phase that take into account the global modernist vision in a local environment.

Research. For example, Michel Ecochard elaborated a study on 'Refugee Problem related to town Planning in Karachi' (1955) for the United Nation.This study holds significant knowledge and was based on his previous work in Morocco. The next section explains how these principles spread out and are currently used.

Figure 2. Areal view of "cite horizontale, Semiramis, Nidd'abeille" (Ecochard,1955).

4.2. The method

When taking into account the diversity of the modern frame, the Moroccan experience was at time the forefront of innovation in architectural design, urban planning. The pioneering methods allowed architects to transcend precepts considered as frim, dogmatic and absolute. The principles are not mere imitation of the western practice. On the contrary, they contributed to the renewal of modern architecture worldwide. Undeniably, these approaches were tested in foreign countries and served as the baseline for the elaboration of Building and Housing

5. The transposition

There is a range of reasons driving the architects and urban planners in Morocco to use modernist tools. Planning process and architectural principles from the colonial period are firmly anchored in the Moroccan way of practice. The remainder of this section, based on fieldwork conducted for this purpose, will elaborate on this point by highliting the impact of this colonial planning model internationally and in the formerly colonized country.

5.1. The perception

The negative or positive perception of heritage is determined by the historical context. "In the case of colonial heritage, the notion must also be revised that 'colonial' is something of minor importance and something to be embarrassed, ashamed or angry about" (Van Roosmalen, 2003, p. 123). The awareness of these ensembles or edifices, which are a part of a worldwide movement yet particularly unique, is an opportunity to valorise certain tools and design processes. The vast plurality of styles and features is characterized by the fact that "each element of this multitude claims its local belonging but also that [and] of a global movement" (Pini and Verdelli, 2012, p. 54). Architects dilute, at the same create, a new way of practice that may be ordinary yet highly specific due to its long lasting legacy.

5.2. The legacy

Following the experimentations, mat-building emerged world-wide in the late 1950. The ideological and social principles have shaped the architects' conception of the collaborative buildings. Indeed, the spatial qualities embodied by this revolutionary form of architecture "where the functions come to enrich the fabric, and the individual gains new freedoms of action through a new shuffled order, based on interconnection, close knit patterns of association and possibilities for growth, diminution and change" (Smithson, 1974, p. 573). In 1961, Candilis and Wood established, in Toulouse, evolving ensembles of habitat, based on theorises developed in Morocco (Cohen et al., 1995). The same architects also worked jointly with Alexis Josic and Manfred Schiedhelm for the design of the Free University of Berlin (1963). Using the same system, Le Corbusier and Guillermo Jullian de Fuente's conceived the Venice Hospital (1964-65) applying climate control elements to its design. Alison and Peter Smithsons' project, namely 'Urban Study and Demonstration Mat-Building' (1968-72) emphasised fully on Arabic traditions, such as the patios (Forès, 2006). These examples are very different from the Moroccan experience, which implements the functional segregation highlithed in Le Corbusier's Athen Charter (1933). However each of them provides opportunities of evolution and change built on a strong underlying patern.

6. Conclusion

The appropriation of planning and design tools requires different scales of analysis at a local and global level. Understanding the complexity of these 20th century modernist edifices contributes to the comprehension of an ordonning system. The uses of such tools are a crucial unresolved problem for the development of large cities. The studied buildings are an example of possible solutions that allowed the architects and urban planners to rethink fundamental aspect of their design. Taking into account the principles applied by modernists, it would be an opportunity to study and optimise these solutions in order to produce a more suitable model. Unfortunately, this is made difficult by the buildings' perception. Indeed, the controversial aspect of colonial heritage do not facilitate its recognition.The way the dwellings were designed and built was a watershed event in the history of modern architecture. They were considered as the 'greatest realisation' since Le Corbusier's housing unit (Cohen and Eleb, 1998). The Moroccan experience is considered as a testimonial of a revolutionary rationalisation of modernist theories.The author has also shown that recent heritage reveals the importance of structural layers and organisation tools. The importance of the uses of modernist principles leads to the following questions: How can contemporary architecture expand from the original concept without diverting it? How to optimize the renewal of this structural system? And more importantly, are the uses of these patterns still relevent? Answering these questions is beyond the scope of this paper. Further research is required to tackle these points.

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CHAPTER #6.03

LEARNING FROM *L'ARCHITECTURE D'AUJOURD'HUI:* A WAY OF DESIGNING A MODERN FOR THE 1950S' ANKARA

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1. Introduction

Revivalist attitudes in architecture began to be outdated from the end of the 1940s in Turkey, and modern approaches were becoming the ongoing architectural trend during the 1950s. This change in architectural thinking seems parallel to the general context of the country. That is, the decade marks a new phase for Turkey in terms of its political interactions with other countries and the world. On the basis of developments, it has been claimed that Turkey became a part of the Western world since the end of the Second World War (Tanyeli, 1998). Besides Turkey's foreign relations, the state's political and economic system, social and cultural life undergoes radical and fundamental changes. After the 1950 election ended twenty-seven years of the Republican rule, the Democrat Party was given a position of authority which opens the way for new policies in the country. As a result of industrialization and mechanization of agriculture, migration from villages and towns to cities brings rapid population growth to the cities, and leads to a dramatic changes in the urban fabric. In addition to extensive construction activities in connection with the migration, the redirection of the economy causes a radical transformation in architectural practice as well: Requirements of new building types, new construction techniques and expanding construction industry become apparent (Tapan, 1984)[1].

Rapid urbanization, Tekeli argues; "generated its own rules and mobilized different social forces in creating a new living environment. Neither architects nor were other professionals able to play any role in this process (Tekeli, 1984, p.26)." The architects of the period, on the other hand, are not ready to discuss the architectural problems of the day within a theoretical frame. They are able to follow the ideas of the architectural realm on the world agenda by way of the expanding communication media. So, "Various architectural solutions published in journals were copied with no regard to appropriateness. Regional characteristics were ignored (Tapan, 1984, p.108)." Therefore, architects in Turkey during the 1950s are strongly influenced by precedents of the International Style without considering the basic environmental, technical and cultural issues. In this context, what might be the reasons for the widening impact of the International Style throughout the 1950s in Turkey? What are the main sources Turkish architects benefited from or what might be the mediums at that time through which modern thought in architecture disseminate? This study aims to address these questions, and tries to analyze the role of an international magazine (i.e. *L'Architecture d'Aujourd'hui*) to produce (other) modernism(s), and to derive modern through one of the modernist iconic buildings of the 1950s in Turkey designed by Turkish architect Nejat Ersin (1924-2010).

2. Architecture in Turkey during the 1950s

The architectural historiography in Turkey conventionally identifies the architecture of the 1950s as a new modernist break[2] to be

[1]Considering the architecture in Turkey, there are also other developments: the Chamber of Architects in Turkey is founded in 1954. A new Planning Expropriation Act is passed in 1956 and the Ministry of Reconstruction and Settlement was established in 1958 (Tekeli, 1984).

[2]The periodical division of after the 1920s according to stylistic changes generally finds acceptance in history writing of architecture in Turkey. Accordingly, the period is broadly divided into decades as follows: 1.The First National Style until the end of the 1920s.2.The Modern Architecture (Functional or Cubic Architecture) until the end of the 1930s.3.The Second National Architecture until the end of the 1940s.4.The International Style until the end of the 1950s (Please see: Alsaç, 1976;Tekeli, 1984; Batur, 2005).

conditioned by the influence of the International Style. Although many researchers in Turkey criticize the mimicry, they attempt to rationalize the dissemination of modern architecture regardless of tracing the sources of inspiration, and that of information.

One underlying reason of the Turkish modernism of the 1950s is new architectural schemes of the twentieth century which could not get along well with the former National Architecture, accordingly, the adaptation of the old style would easily be materialized some themes such as dwellings and mosques, while would not useful and applicable for new building types (Özer, 1963). Another argument discusses the issue in a broader framework, and claims that the National Architecture might be possible in a country with a closed political and economic system, but it is almost impossible to pursue the National Style for a peripheral country (i.e. Turkey), which is already accepted for becoming a member of the western club, and integrated into the international order (Tekeli, 1984, p.25; Tanyeli, 1998).

It may well be argued that younger generations are always open to new ideas, and they effortlessly internalize novelty and new thinking (Kuban, 1961). Furthermore, Turkish architects did not experience difficulty to reconcile with the principles of the modern architecture and to acquire knowledge of the International Style because the basic principles of modern architecture are already part of vernacular architecture in Turkey (Kortan, 1997). It was much easier at that time than the previous decades that Turkish architects were acquainted with the current interests on the architectural agenda by means of the media, in which different approaches and styles were found at the same time:

> This multi-voice situation appears to have had a shock effect on Turkish architects, who passed the last years with limited communication opportunities to the extreme, in a medium of an introverted culture and who were squeezed between certain clichés. This effect had created a strong desire in the architecture sector to try these new trends (Batur, 2005, p.48).

In the same manner, aside from the printed media, expositions had a great effect on Turkish architects for the reason that those exhibitions displayed them new, challenging and interesting architectural thoughts (Alsaç, 1976, p.41)[3].

3. "The Magazine"

Undoubtedly, the media is an important tool in the distribution of architectural practices during the twentieth century. With the advent of printing and photography that architecture has been produced and re-produced in mediums other than buildings such as books, magazines and exhibitions (Colomina, 1988; Colomina & Stead, 2004). A magazine or a book is a medium through which architectural practice and knowledge would be (re)presented, comprehended, and disseminated (Lipstadt,1989). Correspondingly, an architectural magazine is especially crucial in architectural meanings' travels to Turkey too[4]. Besides, a number of Turkish architects practicing all through the 1950s attribute one of the sources of their fascination with modern architecture to *L'Architecture d'Aujourd'hui* (hereafter, AA), the oldest architectural French magazine which is internationally distributed. AA is founded by architect, sculptor and publisher André Bloc (1896-1966); and the first issue was released in November 1930. It seems that the name of the periodical, which means "architecture of today" in English, refers to its aims, and to subjects and content it concerns. Bloc (1931) describes the objectives and the program of AA in the first issue that modern architecture, noble ideas and the richest talents, needed to be revealed, would be publicized by way of the magazine. Modern and contemporary architectures hence were attached importance to the medium of the publication. AA publishes six thematic and

[3]Exhibitions such as "New German Architecture (1943)", "English Architecture (1944)" and "City Planning in Britain (1947)" could be mentioned.

[4]Architectural periodicals in Turkey were also published translations of news, building profiles, or essays from the international architectural scene during the 1950s. Please see the first independent professional architectural periodical in Turkey, *Arkitekt* [Architect] (1931-1980).

three special editions per year (*L'Architecture d'aujourd'hui*, n.d).

The buildings and thoughts of the modern masters on the pages of the magazine opened up new perspectives for Turkish architects (Kortan, 1997). In September 1947, the magazine has issued, for example, a special file on modern architectural practices in South America, titled as "Architecture in Brazil," including the works by Costa, Niemeyer, Levi and Roberto Brothers, and this issue was obtained by almost every architect in Turkey: It was thus impossible not to be influenced from the architectural context presented in the issue (Ersin, 2002). In the preface, the ambassador of Brazil in Paris clarifies the role of the file in sharing experiences. He believes that an architect does not work only for his own country, all nations benefit from the lessons learned. He wishes the works, researches and experiences presented in the magazine to contribute to the whole world (Preface de Son Excellence L'Ambassadeur du Bresil a Paris, 1947, p.2). The editors and the authors of AA are aware of the fact that the modern architecture would be represented and circulated through the media by means of buildings as well as texts and images. The Magazine's mediation beyond spaces and times made learning from a magazine possible for architects in several circles abroad, for instance, for those practicing in Turkey. The magazine indeed enabled a creative way of appropriation. Le Corbusier's Unité d'Habitation in Marseille (1947, France)[5], included in the same special issue, in this regard became influential in the design of one of the iconic modernist buildings of the 1950s in Ankara, Turkey.

4. The Architect & The Building

Turkish architect Nejat Ersin (1924-2010) graduated from the Fine Arts Academy in Istanbul in 1950. Although he received a classical training which basically focused on the canons of National Architecture, Ersin wanted to design projects that would reflect the architecture of his period; the architectural environment in Turkey in the 1950s, in support of his desire, offered a milieu open for international influences. As a timely coincidence, the architectural magazines published both at home and abroad were displaying and presenting the canonical examples of post-war modernism designed by the contemporary modern masters worldwide during the years Ersin started his architecture career.

After his graduation, Nejat Ersin worked in different areas of the profession; meanwhile, he also entered architectural design competitions together with his friends. In 1952, he started to work at the Directorate of State Airports' Construction Department in Ankara. Ersin and his co-workers - architects and engineers working at the Directorate founded a housing cooperative, named as "Workers of the Directorate of State Airports' Building Cooperative." The cooperative appointed Nejat Ersin both as the project architect and construction supervisor. Thus, the residential building, known by its address as Cinnah 19 today, was realized in 1958-1960 by the team of Nejat Ersin with the assistance of engineer Yavuz Kireç, and architects Necdet Dağ and Danyal Çiper, with the support of the housing credit taken from the Emlak Kredi Bank. The cooperative members briefed Ersin prior to his design studies as such: "Build a housing block as you want, a building to be remembered (Ersin, 2002, p.11)[6]." Ersin, therefore approached the project in a manner different than the conventional applications as his main goal was not to design a standard housing cooperative similar to the ones in Ankara or in Turkey at that time. For this reason, he started his research and design simultaneously in 1956. He explains that this project is one of the projects he spent lots of effort. During the design process, the architectural magazines that he was subscribed to since his undergraduate years, the library at the Directorate, and the library of the American Cultural Institute and that of Goethe-Institut in Ankara, with their collections including current architectural publications constituted the main sources for him. Ersin affirms that he is inspired

[5]In 1947, the sixth issue of *Arkitekt* magazine features an interview with Le Corbusier (see: Demiren, 1947), and in 1957, the Unité in Berlin was presented to the Turkish architects in the third issue of *Arkitekt* (see: Erdener, 1957).

[6]The story in this paragraph is entirely based upon the architect's own narrative (Please see: Ersin, 2002).

by the world's leading architects such as Le Corbusier, Oscar Niemeyer, Lucio Costa and Edward Durrel Stone. In particular, the housing blocks of Corbusier, and his ideals awakened his interest.

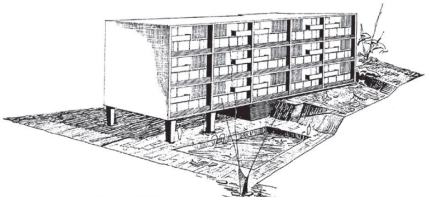

Figure 1. Axonometric view of the building. Source: Cengizkan (2002).

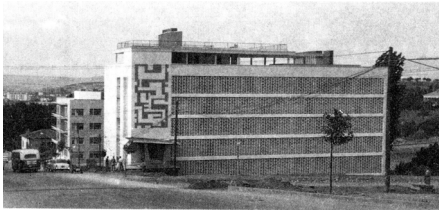

Figure 2. Southern (rear) façade of the building with brise-soleil, circa 1960. Source: Ersin (2002).

The housing cooperative to be designed by him would be a good opportunity of experimentation towards modernism. By emulating Corbusier and the *Unité*, Ersin designed and realized a modernist iconic building in the 1950s' Ankara. The building, located perpendicular to the main street, gets entrance from its short facade and is oriented to the north, towards the cityscape. It consists of seventeen apartments, fifteen of which are duplexes. In order to offer comfortable living places besides a warm domestic environment for its residents (Ersin, 2002), the building aims to realize collective living. It seems that the architects accomplished the desire for the communal living of neighbors, who shared similar social, cultural and economic status, in a spatial sense (Cengizkan, 2002), and proposed access from the semi-open street like circulation corridors of the floors to the common spaces both on the ground/basement floor and the roof terrace. Using *pilotis* –raising the apartment block above the ground- without articulating the topography shows the architect's sensitivity in establishing a profound relationship between the existing context, landscape and the building. To design common spaces on the roof garden, i.e. a swimming pool, a sun terrace and an American bar, shows the attempt to create a place for communal living while at the same time emphasizing the socio-cultural life of the 1950s in Turkey. Other common characteristics of the period could be noted in Cinnah 19's architecture: *brise-soleil* on the southern façade –inspired by the works of Edward Durell Stone-[7], overall glass façades for the living rooms, the gallery that provides an experience of continuous inner volume, the built-in furniture especially designed for the apartments like the library, fireplace and bathtub, wooden ladder steps and balustrade, and other applications such as the mosaic flooring, all with an excellent workmanship. All the details were unique designs and quality productions of the period considering that the construction materials had not been industrialized in the country yet.

5. Conclusion

Having analyzed AA's role to produce modern architecture in Turkey through one of the iconic cases of the 1950s, it seems that AA becomes functional in a period when architects in Turkey were seeking novelty in their practice, and the magazine mediates the reception of modern architectural language. In fact, when the printed media in architecture began to spread from the late fifteenth century onwards, architecture was no longer remained as a profession (or a field of knowledge) to be learned merely from a master in a (construction) site. The printed mediums do not only present but also distribute and re-produce architectural practice, knowledge, theory, discourse and thought. In this way, the medium also takes an active pragmatic role in enhancing especially the professional development of young practicing architects

[7]The special file on Brazil of AA includes a small history of *brise-soleil* with the selection of Corbusier's works.

and architecture students in their self-taught process of learning by sharing experiences, and by learning through a discussion of buildings as case-studies. Even though this study focuses on a single case, it shows that a research focusing on the relationship between print culture and built environment in this respect, defines a potential framework to discuss and understand the architectural production of a period.

In the case of Cinnah 19, the design starting with an inspiration from the formal characteristics of the International Style, gradually created its own solutions and architecture, in other words, it "(re) produced (other) modernism." The mediation of journals such as *L'Architecture d'Aujourd'hui* in disseminating modern architecture gave rise to the creative ways of appropriation, and enabled to introduce contemporary architectural tendencies in countries that were transforming culturally and socially in the 1950s, including Turkey. One of the iconic examples of Turkish modernism of the 1950s, even so for today, was designed by Nejat Ersin, a prominent architect of the period with the courage, inspiration and knowledge he got from the international architectural context displayed in the magazine; his Cinnah 19 Apartment Block design reflects the loyalty he displayed to modern architecture and its masters as a comparable example.

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CHAPTER #6.04

HUMAN BEHAVIOUR AND URBAN FORM. A STUDY FROM ALEXANDER'S PATTERNS

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1. Introduction and methodology of the study

Urban form must have a coherent sense. The sense of urban form lies in its adequacy for human well-being purpose. The appropriateness of form to human behaviour represents a key dimension for this good inhabiting. In this direction, Amos Rapoport among others has already developed a relevant contribution.

We want to refer here, in the significant context of the *Valencia International Biennial of Research in Architecture*, to a central question of architectural research. In the fundamental adequacy of urban design to inhabit human and the desirable human behaviors for wellness in a broad sense, a sufficiently systematic and shared investigation does not take place in architecture. And this is the approach that really favors an urban design for citizens and their good life in the city.

It is necessary to return to the valuable theoretical and empirical contributions of the architect and professor Rapoport that well pointed in this sense on the disciplinary investigation: *"In few occasions the social sciences have described what happens in a three-dimensional inhabited space, on a small scale, which is the space in which its inhabitants live. This has been the exclusive field of work of design professionals. But the last ones have privileged action against academia and research and have not been influenced by new ideas from other cultural fields, thus leaving without developing a theoretical basis."* (Rapoport 1978, p.18).

Urban design has often been based on action, resulting in intuitive or strictly formalistic attitudes without adequate and systematic attention to desirable human behavior in the city. In this way Rapoport continues: *"Urban design needs to clarify objectives based on authentic knowledge. These objectives are necessary not only to make decisions about what needs to be designed, but also to evaluate what has already been designed."* (Rapoport 1978, p.19).

From this perspective, in our study, we want to focus on Christopher Alexander's research in A Pattern Language regarding urban patterns. Many of these patterns are linked to healthy human behaviours that find in the corresponding pattern a specific preform, that is to say, a sketch of different possibilities of form. We want to focus only on the selection and analysis of the most significant urban patterns (or preforms) to generate healthy human behavior. Therefore, we will limit ourselves to this specific approach to Alexander's research.

A Pattern Language by Christopher Alexander is an interesting and rich theoretical-practical research that, although improvable in some of its considerations, offers a useful panorama. Frequently, this lack of a systematic and shared perspective of urban design research has been made forgeting the contribution of estimable researches. It is convenient to remember in his time the broad advance in the architectural research of Renaissance treatise. Some treaties were based on the previous ones with the intention always to improve and expand the previous architectural knowledge and practice. The cumulative and critical attitude constitutes the true scientific attitude of sensible use of previous knowledge.

This research has the interest of taking advantage of Alexander's outstanding research in a new direction that leads closer to human behaviour in the city. In this way, healthy human behaviour in the city can be linked to the concept of a specific preform. Each established preform according to this way would provide a solid anthropological basis so that urban designers set their personal formal proposals creatively. In this way, the objective factor of

the anthropological preform and the subjective one of the creative freedom committed to reality can be coordinated methodologically. Thus, the aim of this study consists in offering a grass-roots methodology constituted by preforms corresponding to healthy human behaviours in the city from Alexander's background. Urban planners may use this methodology as an anthropological basis for their specific designs.
In this way, the most convincing urban patterns (or the most convincing aspects of the pattern) that have a clear relationship with healthy human behaviors are selected and studied briefly. The numeration of Alexander's patterns study is followed here.

Acronyms used: PD: Pattern Description. HHB: Healthy Human Behaviours (in a broad sense)

2. Study of selected patterns

2. THE DISTRIBUTION OF TOWNS. PD: Many small cities and only a few large ones, with adequate distribution in the territory.
HHB: Improvement of the small cities', the imbalance city – field is avoid, improvement of the ecological balance.

3. CITY COUNTRY FINGERS. PD: Cities must limit with the field almost in all their points. Interlaced entrances of urban land and rural land.
HHB: People feel comfortable when they have access to the countryside, agriculture, plants and animals. Keep alive the natural roots of the human being. Dissatisfaction of the current city.

4. AGRICULTURAL VALLEYS. PD: Leave the bottoms of the valleys intact and suitable for agriculture.
HHB: Keep alive the natural roots of the human being.

6. COUNTRY TOWNS. PD: Preserve the towns where they exist and stimulate the growth of other new self-sufficient, with a full life. Encourage in them services for cities and a local industry base, as a collective concern of the entire region.
HHB: Protection of people, the countryside and its inhabitants.

9. SCATTERED WORK. PD: Disperse work places throughout the city.
HHB: Proximity between housing and work in people's lives.

10. MAGIC OF THE CITY. PD: The magic of the city within the reach of all inhabitants by the decentralization of the attractive urban activity (restaurants, theaters, shops, etc.)
HHB: Easy accessibility of all inhabitants to attractive urban activities.

11. LOCAL TRANSPORT AREAS. PD: System with main roads in the city of movement of cars and trucks; and local roads with reduced traffic.
HHB: Reducing pollution, increasing beauty and human contact

14.IDENTIFIABLE NEIGHBORHOOD. PD: Facilitate the definition of identifiable neighborhoods.
HHB: People need to belong to an identifiable space unit, by identity and proximity knowledge.

16. WEB OF PUBLIC TRANSPORTATION. PD: Coordination of systems of public transportation (buses, trains, taxis…)
HHB: Improvement of connectivity for users; reduction of waiting time and walking distance between two connecting systems; overcoming the struggle between companies and organisms for attracting customers each other.

17. RING ROADS. PD: Traffic bypass around the city avoiding crossing the inner city; layout without affecting communities or landscape.
HHB: Fast access to different neighborhoods without having to cross the local transportation areas or interfering with the connection to the open countryside; reduction of the acoustic impact.

19. WEB OF SHOPPING. PD: Proximity trade in residential areas, avoiding the concentration of competitor businesses in specific areas; however, in case of shops of different fields, the grouping is not problematic.
HHB: Improvement of the economic stability of shops because of the equitable distribution of the customers' basins; cooperation rather than competition; better service for customers.

21. FOUR-STORY LIMIT. PD: The high-rise housing have adverse effects on the mental and social health. It is necessary to limit the height of residential buildings in the cities.
HHB: Major proximity to the urban space and consequent improvement of socialization; reduction of the urban development speculation; decrease of social alienation.

23. PARALLEL ROADS. PD: Asymmetrical urban fabric comprising a system of parallel and alternating one-way streets with smaller transverse secondary ones.
HHB: Traffic flow improvement, which compensates the necessary detour to reach the destination; alternative discouraging the use of automobile in short trips, encouraging walking, biking...

25. ACCESS TO WATER. PD: Approach roads at right angles to areas with water (rivers, lakes, beaches...); if parallel, at least well spaced out; reduced parking areas.
HHB: Permeability into natural spaces with water; preservation of a belt of common land immediately beside the water; restraint of environmental impact.

27. MEN AND WOMEN. PD: Well-balanced cities regarding the feminine and masculine spirits.
HHB: Design on any scale under the influence of both men and women, from an urban space to a simple housing.

30. ACTIVITY NODES. PD: People look for concentrations of people whenever possible. We must group densely the facilities around very small public squares that work as nodes, so that all the pedestrian community movement cross those nodes.
HHB: Promotion of the activity in the public space; improvement of inter-personal and social relationships.

35. HOUSEHOLD MIX. PD: Development of heterogeneous types of households in every neighborhood and in every cluster of houses, so that one-person households, couples, families with children and group households are side by side.
HHB: Encouragement of coexistence between people of different ages and different types of family, obtaining a more homogeneous social distribution.

36. DEGREES OF PUBLICNESS. PD: Some people want to live where there is the action, others prefer the isolation. To satisfy each personality it is proposed that each neighborhood has three types of housing: those closest to the action, those located halfway and houses completely isolated.
HHB: Possibility of finding areas with different activity intensities according to the needs of each citizen.

37. HOUSE CLUSTER. PD: The conglomerate of dwellings and land immediately adjacent to the home itself is very important, since it allows a gradual differentiation in the local land use, and is also the natural focus of the neighborhood interaction.
HHB: Interaction between neighbors fosters healthy human relationships among the inhabitants of the same area.

40. OLD PEOPLE EVERYWHERE. PD: Elderly people must be present in each neighborhood, forming part of it, not concentrated in one place. This will preserve the symbiosis between young and old people and give them the mutual support that they need.
HHB: Encouraging relationships between young people and the elderly is very positive, young people can learn from the experience of the elderly, and old people feel more active when they share with young people.

41. WORK COMMUNITY. PD: Generation of limited work communities, with two levels of grouping. Groups of communities around courtyards and, in turn, gathered around squares or esplanades. Courtyards or squares will have the services according to their scale.
HHB: Socialization is favored and the workplace acquires shades that make it a place to "live". Dispersal is avoided and, at the same time, excessive centralization; generating a balance in the city.

43. UNIVERSITY AS A MARKETPLACE. PD: A university dispersed in the city in a hierarchical way. A model of pedestrian streets and

crossroads in which the university dependencies that favor the exchange are organized.
HHB: The university-market favors access to training, the pedestrian structure and encourages spaces for urban relationships.

44. LOCAL TOWN HALL. PD: Identification of a place of power in the community, where the *arena* and the *zone of community projects* are distinguished. *Arena* is the point at which the transfer between community and representative apparatus takes place. The *zone of community projects* are the installations in which the representative apparatus elaborates the proposals towards higher organisms. The council will be according to the scale of the corresponding community and must be located at points of confluence.
HHB: The existence of physical meeting points with its representatives of the community favors the efficiency of the representative system, the identity and the proximity of the various administrations, which results in greater citizen participation.

45. NECKLACE OF COMMUNITY PROJECTS. PD: Urban redoubts that favor spontaneous self-organization beyond the urban councils and with their own channels of connection with citizens. These are small shops that are defined as ideas *store*.
HHB: The community provides its own spaces for spontaneous criticism and accepts them, which favors the political health of the community and diversity.

46. MARKET OF MANY SHOPS. PD: Safeguard the concept of the retail market in front of dispersed stores and supermarkets with a single management, recovering a meeting space with diversity.
HHB: It favors the survival of small producers, the possibilities of supply for the inhabitant, in terms of the consumption of products and in terms of existential experience, both in relation to the atmosphere and social communication.

47. HEALTH CENTER. PD: A health system of proximity and prevention, with spaces for the stimulation of healthy habits.
HHB: These centers are key in the promotion of healthy life, in the economic sustainability and effectiveness of the public health system thanks to prevention and early detection. The atmospheric quality of the space and the activities carried out in it eliminate the concept of a ghetto associated with health spaces.

48. HOUSING IN BETWEEN. PD: Homes construction in the commercial, teaching, productive or service fabric, with multiple provisions but guaranteeing open spaces for privacy.
HHB: It is intended to avoid the sectorization of the city. There is a link between property-residence and involvement in sustaining and improving the public space, while this is nourished by the vitality of the home.

51. GREEN STREETS. PD: Certain types of streets, such as local access roads to buildings, can be solved with a large percentage of green matter, avoiding the presence of excessive parking.
HHB: The green of certain local roads limits traffic, favoring pedestrian use and environmental quality.

53. MAIN GATEWAYS. PD: Identity elements that allow recognizing limits and transitions, as happens with the traditional urban gates.
HHB: Urban gates have played a key identity role. They can facilitate identification and orientation.

54. ROAD CROSSING. PD: Elevation of the pedestrian route between 15 and 30 cm and make its presence evident with some identifying element.
HHB: Improves the visibility of the pedestrian, reduces the risk of accidents.

56. BIKE PATHS AND RACKS. PD: Separation of the cycling itinerary within the mixed system of circulation with row of trees and / or elevation of the pedestrian crossing.
HHB: Improves the visibility of the pedestrian, reduces the risk of accidents.

57. CHILDREN IN THE CITY. PD: Protected green areas (abundance of houses and shops) where children can wander alone and get in touch with activities and adult lifestyles.
HHB: Knowledge and learning of daily actions and trades by children.

58. CARNIVAL. PD: Pedestrian streets with alleys and barracks connected to the theaters.
HHB: Unleash attitudes, socially accepted in the form of crazy shows, dance, music, street theater, extravagances, allowing people to approach their dreams and release their follies.

59. QUIET BACKS. PD: Silent itineraries in the rear of buildings sufficiently distanced from them with gardens, walls or dense vegetation; connected to each other and converging in ponds, streams and patches of vegetation.
HHB: Connection with nature in a noisy and densely populated environment.

60. ACCESIBLE GREEN. PD: Many parks and green areas of small size and scattered in the city.
HHB: Get in touch with nature and disconnect from the bustle.

61. SMALL PUBLIC SQUARES. PD: Numerous small sized squares scattered throughout the city.
HHB: Promotion of social relations, enjoyment of leisure time, economic balance between neighborhoods and improvement of the local economy.

63. DANCING IN THE STREET. PD: A platform for musicians, a hard surface to dance around, resting places with seats and some food and drink stands.
HHB: Encourage social relationships and reduce discomfort and fear of others, improve the local economy.

66. HOLY GROUND. PD: Enclosures nested, stratified or embedded.
HHB: To vivify spiritual rites related to the culture of each place

3. Conclusions

This communication wanted to present on the one hand the need for a theoretical and practical foundation and systematization of the relationships between urban form and convenient human behavior in the city.
On the other hand, the communication wants to provide a methodological instrument to take advantage of the suggestive patterns of Alexander, in the indicated direction, for the utility and easy enrichment of the urban designer.

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CHAPTER #6.05

TOWARDS A HUMBLE ARCHITECTURE: AMBIGUITY, INEVITABILITY, AND THE SEARCH FOR A UNIFIED FORM

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1. Prologue

Regardless of medium, whether a sonata by Pierre Boulez or a chapel by Mies van der Rohe, the effort to give order is a constant contributor to the creative act. The intellect persists in the quest for beauty and order within form. But form is an ambiguous concept that settles at the crossroads of the ideal and the material, nourished by social, cultural, optic, and aesthetic codes.

The relation of the *architekton* [αρχιτέκτων], appearing in Euripides' *Cyclops* (circa 424 BCE) and in Aristophanes' *Peace* (421 BCE), to order is not a coincidence. Proceeding both the discipline "architektura" and the profession master (archi) craftsman (techton), both protagonists are concerned with restoring "social order, justice, and peace" by undertaking the action of "architecting." (Landrum: 2012). Dealing with the different roles attributed to the architect, Parcell (2012) points to a conceptual change having its roots in the dichotomy between idea and matter. *Architekton*, as the provider of a greater knowledge becomes "associated only with the mind" whereas *thetes* remains as the manual laborer, whose knowledge is confined to the hand. This rupture is important for the concept of *techne*, which is not limited to a "catalogue of technical skills" but refers to a broader "realm of knowledge and intervention," including artisans, patrons, and predecessor and "relied on cultural memory, empirical experience, and strategies for circumventing limits." (Parcell) This paper excavates actors and concepts that will allow a discussion of key points regarding "humble" architecture: idea, order, design, an overarching concept of form, and the architect as "long distance runner."

2. Idea, Order, and Beauty: Between Ambiguity and Inevitability

The architect's quest for order remains as an invariable regardless of time and place. Archaic beginnings of this quest took cosmos for granted as a model of flawlessness and dwelled on an observation-based analogy. In an inevitably spreading reign throughout centuries, priorities changed from an observation-imitation based one to a self-critical and reflexive-thinking one. The consequences, which Tzonis (1972) refers to as a change from *pre-rational* to *rational,* are traceable in both architecture and music. In both we see the persistence of the intellect transcending limitations of the temporal, geographical, stylistic, and medium in order to arrive at conceptual constructs of larger scale. The intellect was present, persistent and gave order through creative activity, dominating the course of form. However, the dominance of pure intellect led to a gradual rise of oppression. (Tzonis: 1972) As the relation of order and intellect is to be expected, the relation of order and proportions is one of uncertainty. The intellect has been persistently haunted to unite the whole under an order dependent on the harmonic relation of parts. This is seen as early as the Vitruvian triad: *fermitatis*, or durability, *utilitatis*, or utility, and *venustatis*, or beauty, as the properties that a building should posses. Throughout the following centuries the concepts that defined the relation of form to order and beauty changed. In other words, the history of form and beauty is a history of changing priorities. Vitruvian concepts gained more or less fairly distributed importance. For Alberti of the fifteenth century, beauty set the pace, whereas for Palladio the emphasis was on *utilitas*. For Laugier and Semper it was on *fermitas* and, for example, Hannes Meyer of the

twentieth century set the priority in a socially and politically framed *utilitas*.

Mies's approach to form and the interrelation of form and order should also be mentioned here. Form for Mies is "not always simply a result" and definitely is not the greater goal but a consequence of the process; there is no form "in and for itself," and under the influence of Romano Guardini, form is coupled with life. Whereas, the equation of life and form leads to an assertion of life, resisting form. In his notebooks Mies asserts that new forms could be reached through new orders. Mies first rejects "the mechanistic principle of order" because of its overemphasis on materialism and functionalism. This is followed by the rejection of the idealistic property of order, referring to its overemphasis on the ideal and formal. After rejecting the materialistic and functional, and then the idealistic, Mies affirms an "organic principle of order" in concordance with the philosophy of Guardini. In this philosophy, the antipodes of matter and spirit, practicality and value, and technology and art, are set in an organic relation. Life, comprising the spiritual/intellectual [geistlich] and concrete, is the criterion and source of form, and set as the starting point of the process of form giving. (Neumeyer: 1994)

In music, the concept of ambiguity, which Wagner (2000) sets as a principle for every art form, has the fundamental property of allowing the presence of open ends and vague definitions. Although there is common tendency to perceive music as mostly a product of inspiration, supported by a flawless flow of feelings, it is—as every artifact—a product of reason, which has evolved to function in a structural manner. Tzonis and Lefaivre also point to ambiguity, referring to the dissonant beginnings of Mozart's String *Quartet in Cmaj K.465* and their structural similarity to the façade of Palladio's Il Redentore. Both share a suspended tension created by an effort to resolve an anomaly into an ambiguity. However, finally the "ambiguity" itself is "overthrown, as the conjunct elements join in a larger, formal whole." As the musical piece, after a dissonant and "disjointed" introduction, "rushes to confirm the classical canon," likewise do the primary and secondary systems—Corinthian minor and major pediments—of the "two shafts" in Palladio's Il Redentore are "crowned by tympana" embracing "the whole." (Tzonis, Lefaivre: 1986) Introducing certain orders of different scale at different points through different phases of the creative process, result in various ambiguities and inevitabilities in the architecture.

3. Form: Persistence of the Creative Mind

The journey of the concept of "form" in architecture starts with an early dependence on mathematical relations, dwelling on a mighty, perfect Creator, or Nature, which is composed of unalterable harmonic proportions and a transcendental, atemporal beauty. It would not be wrong to say that throughout the Middle Ages this link between form and beauty was preserved, though in a rather too direct manner. During the late eighteenth and nineteenth centuries there was an attempt to break with the determinacy of the classical through the introduction of subjectivity, technology, and archeology. The dawn of the twentieth century marks a critical intervention, a time of socially and politically engaged utilitarianism under of the reign of mass production. In order to reconceptualize "form" and enable a broader discussion it is necessary to emancipate it from its confinement to medium and introduce it through a set of concepts instead: the creative act, ideas, order, and the intellect.

Although this article will not deal with a detailed discussion on musical form, certain similarities are worth mentioning. How one form, for example, the sonata, was transformed from decorative clusters to an idea and a proposal for structuring music from one period to another. Similar to the architect's search for a traceable thread, as in the introverted first phase of Kahn's creative process, the journey of the sonata from a "decorative prototype" for dance and vocal music to that of an overarching layout, is the quest for a structural idea. Behind this is an understanding that an abstract concept can serve to beautifully order an artifact. Thus a debate on formal relations between architecture and music could be comprehended through the nature of creative process. The relevance of

Anton Webern's approach to idea as a traceable constant for music is also valid for architecture. Whereas is underlining of the importance of the sonata as an idea and the significance of this idea in the development of musical thought is one of the most subtle expressions regarding form. Webern (1963) claims that forms are the consequences of organizing space in music.

As one of the goals of this article is to depart from a visual concept of form and to present instead the spatial and the ideal, of interest are the renderings of two architects who emphasize the abstraction of architectural form. Their significance lies in their effort to mark the beginnings of form in the very beginnings of the creative process, at a point where form is still shapeless. Kahn's approach, dwelling on the platonic idea, and enabling an abstract and transcendental interpretation of form serves as the first example. Form, as a proposal for order, is shapeless, immeasurable, and impersonal: it characterizes a "harmony of spaces good for a certain activity of man." This abstract notion of form comprises function at its most basics, as the characteristics implying to it, and as the set of guidelines for how to relate the parts to obtain a whole. (Kahn: 2003) For Kahn a house "is the abstract characteristics of spaces good to live in" and embedded within the "nature of man." (Prown, Denavit: 2014) Likewise, in a library one can trace how form is seen in particular relationships and how these become a basis for design: "A space order for a library which encompasses many possible relationships between books, people and services could posses a universal quality of adjusting to changing human needs, translatable into architecture." (Kohane: 1990) This leads to a form with spaces hierarchically ordered. His approach to design broadens the space for a dialogic scrutiny between the intellectual, social, and cultural realms.

Kahn's "creative cycle" begins with a confrontation, a "challenge" to be taken. Once the challenge is taken, the architect experiences an introverted search, a phase of philosophical meditation requiring a "profound probe of history and beyond memory of any specific form." (Griswold Tyng: 2002) As Kohane points out, in the case of a library this means a contemplation of reading, as well as arriving at a "sense of intimacy" through observing the "precedent library spaces a consequence of masonry construction with niches and vaults." As the process continues, the decisions regarding form—harboring the intuitive meaning of the institution—would then be revisited to check whether the design-to-be is still in concordance with it. (Kohane) In this sense it is not a linear process. It operates in a cyclic way, in an open manner, allowing the creative act to, on the one hand individualize and, on the other, to socialize. For each member of his tripartite diagram Kahn attaches a clarifying word or concept accompanied by a question as a driving force. Under "nature of space:" "desire" and "what do you want," under "order:" "seed" and "what are the principles which lead to its being," and for "design:" "composition," and "what are the circumstances (environment) that are at play." One of the most valuable aspects of Kahn's approach is that he manages to propose a methodology of pragmatic resolutions within an introverted, creative process laden with the poetical, metaphorical, and intellectual. The process from form to design is an intellectual and spiritual journey from "silence" to "light."

The second approach in the abstract understanding of form is that of Ziya Tanali and his introduction of terms such as format, structure, construction, essence, and substance. Tanali (2012) states that within each field of art, form rises from the inner dynamics of a specific medium; one can take the sonata in music, the novel in literature or, for example, the house in architecture. However, he argues that this nomenclature is misleading, since these are "formats" and not forms, i.e., formats of expression that are to be utilized by the artist. Hence, formats for the spatial realm inherently have a function and these function-bearing formats correspond to abstract forms. Formats define an overall makeup, a layout, or a method for how an architectural object would function whereas forms "are the conveyers of the meaning or content." It would not be misleading to conclude that architecture thus comprises externally determined formats and internally conceptualized forms. Architecture deals with functional forms that propose infinite spatial

possibilities. He relates them to the essence of an architectural object. There are also certain concepts that relate the approaches of Kahn and Tanali. Tanali argues that forms belong to the structural elements similar to Kahn's perception of form giving order to how the parts may relate to a whole.

4. Epilogue: Towards a Humble Architecture

Architecture, as Pallasmaa (2018) sets forth, is not "an invention of a single architect." On the contrary, it is "a distillation of history, tradition and collective culture." The life of an architect, from the early formative years to those of more maturity, is the life of an individual confronting a micro and macro cosmos distilled in collective memory. It is *perpetuum mobile*, a continuously evolving whole, inevitably having nodal points, or points to acknowledge when one looks back. These also serve as departures for an act of legitimate pickpocketing leading to traceability. Within this whole the architect—recalling saxophonist Dave Liebman's words—is a "long distance runner." Ziya Tanali located his approach to architecture "somewhere between Nordic coldness and Mexican poverty." It was through Tanali that I was introduced to the universe of this humble, distant architecture of the latter. This epilogue will deal with the latter and is confined to the architecture of Manuel Cervantes. Rather than plunging into the depths of theory and criticism, my aim is to present certain supporting concepts towards an architecture that celebrates life. Fernanda Canales' (2018) conversation with Cervantes reveals the steps in his design process. He relies on creative repetition, introducing leitmotivs to be thrifty yet without compromising genuineness, the significance of temporality and timelessness, the cycle of life-idea-artifact-life, and nourishing the interaction of other artistic disciplines as a source of inspiration. Burian's (2018) introduction article on Cervantes with its title, "poetics of things as they are," declares a longing for humbleness loaded with "a minimalism" that is "not emotionally reductive," to be handled with a "process of simplification" leading to an "experiential complexity [and] unexpected subtleties." (Pallasmaa) The notion that architecture could be "at once beautiful and just, modern and culturally specific, locally significant and universally eloquent, seductive and respectful" was not only historically valid but could also be traced in "modernity." (Pérez-Gómez: 2006) Humble architecture is about an "ordinariness that passes through the hands of a poet." (Prown, Denavit) The path towards a humble, respectful, genuine, and creative architecture will also lead to a "non-oppressive environment" (Tzonis: 1972) and vice versa.

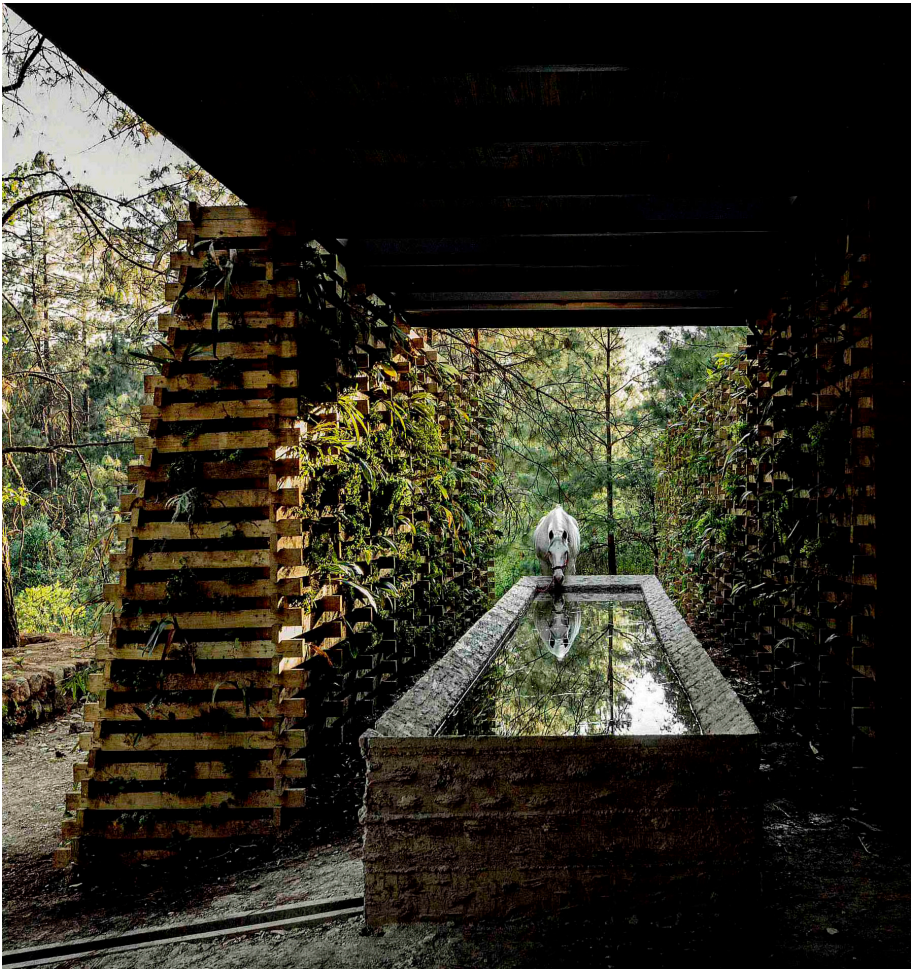

Figure 1. Pabellón El Orquideario by Miguel Cervantes. Photo: Rafael Gamo. Source:El Croquis (2018).

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CHAPTER #6.06

THE INVERSE CANON

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1. Introduction

The inverse canon, in music, is a composition that combines a melody with one or more imitations. In accordance with the music jargon, it could be defined as a contrapuntal composition, or a combination of melodies that follow the rules handed down by tradition. The idea is that the various parts must be distinguished, independent from one another, but still following imitative *processes*.
The same Bauman, in the text *Retrotopia*, states that tradition is not imagined as it could be today but simply as it was. Retrotopic phenomena, as the sociologist defines them, mean that we turn to a past of presumed certainties in the face of a more uncertain future, we are witnessing a global epidemic of nostalgia after the infatuation of a presumed progress, we are closed, hidden, sealed in places, within the roots of identities. We could say it is a state of mind and at the same time an intellectual drift that looks to a mythologized, reinterpreted one and shaped to some past time. Having all the futuristic utopias fallen, the future is no longer seen as a place of possibility. The past, adorned by tradition, seen as a stratification of events that are not entirely fair and correct, becomes the only defensible trench of present existence. The only possible feeling, in this frame of reference, is nostalgia that generates a feeling of loss and disorientation, but at the same time it is a great love story with one's own imagination. The danger of nostalgia is that it tends to confuse the real perspective with the imaginary one.
In fact, architecture today moves on several fronts: on the one hand we have the retrotopic one, linkedto presumed nostalgia that investigates, or hides, through themes such as simplicity, reuse, and the rustic building; on the other we have the front of the imaginary, of exaggerations, of the wrapping that envelops and distorts the landscape, or creates it, supported by technical and technological exasperation; then there is another research front which places purity, the simplicity of form as an expressive means of contemporaneity.
An increasingly fragile compositional research leads to daily uncertainty, without solid points of reference, abandoned to an unpredictable, liquis destiny, where the eternal becomes infinite. As a result, tormented by the desire for belonging and autonomy, architecture today experiences the bitter taste of disorientation and bewilderment, no longer recognizing itself in narratives capable of reconnecting past, present and future in a perspective of progress and quality.
The past is transformed into a reassuring condition and in the only acceptable perspective, imitated, trapped in the memory without a reinterpretation but only as a canon to be imitated.
The moment we are excperiencing is the one of transaction, meaning settling or compromise. Returning to the present, the new scenarios seem to foresee a return to the past. What does this mean? It means moving forward. Opening a parenthesis, we are talking of a historical moment, where we realize that we have exploited most of our planet's resources. The golden era of oil is ending. We will have to look at the world in a totally new way. Maybe it is not what we expected a few years ago, but the situation is real; local and global identities are changing. In the foreground, today two complex realities emerge: the world and the individual, the place par excellence and the actors. We no longer speak of local places, thus referring to the city or the state where we live, but the mink, the politics of the present moment points the eye to the planet, with its metamorphosis problems and the human being as its inhabitant. The emphasis is more on actions, daily practices, than on spaces. In fact, the spaces of action still

exist regardless of the actors, consequently they are places, where reflections and perceptions merge. There is another difference between actions and practices, the former are routinized while the latter are reflective. In the spaces of action there is the creative act that does not accept boundaries by converting the limits, space-time, into opportunities in the search for a new identity.
The identity we seek is not found in the clarity of signs and forms, but in the ability to capture and combine differences, to establish coherences or to assume, to design dissonances. And if it is true that the space between things is even more important than things, if it is true that the logos, the relationship are the most important, here the theme of margin emerges as fundamental, border of that no-man's land that, to be of no one, can become a land of all or simply an identifying void among the different entities that make up the city. The element, perhaps, characterizing this inversion is the aspiration, but also the nostalgia of man, and not the designer to transform, to hybridize the artificial or natural reality that surrounds it.
This is the new hybrid landscape, no longer natural, but hybridized by the desire of the common man. This type of transformation has invested, and still does, all areas of life, not just cities or architecture, but also spoken and figurative language. This profound practical-conceptual change must be sought through the analysis of those logical structures that lead to such modification of architecture and landscape. Both spoken and figured structures have undergone a profound transformation, influenced by the way of life and the perception of life. Architecture is in search of a form or non-form, which no longer reflects the man of industrial society, but the man of the digital society. It is open to new situations, to new dynamics dictated by the digital society, capable of reinventing everything that surrounds it, expanding its knowledge, giving answers to questions and formulating new ones. Before talking about the landscape, we need to analyze the meaning of nature. In the industrial age, nature had to be exploited, its resources had to be exploited, today in the digital age, the computerization has to be enhanced.
Consequently the landscape of the digital age is a container of flows of various kinds; if we consider the city a landscape, its buildings are mountains. To try to tie together the threads of the many themes that we began to weave, but almost never bring them to completion, it could be said that the ambivalence we all experience, almost always when we try to give an answer to the problem of identity, of architecture and of the landscape, is immediate, simple and genuine. And the confusion it provokes in our mind is also genuine. There is no infallible recipe for solving the problems to which this confusion leads. Using Bauman's words we can say that we do not live at the end of the story, nor at the beginning of the end. We are simply at the threshold of another great metamorphosis.

2. Geometric canon

Going back to music, the classical technique of counterpoint developed a precise and technical language to describe the canons, the methods to execute them and build them. It should be noted that the world of music, like that of architecture, has two components that are connected to each other, on the one hand we have the artistic one, linked to real and virtual emotions, capable to involve both the performer, in this case the designer, both the listener, the user, on the other the more technical scientific one linked to physical laws, in our case not only to those but also to compositional methods. The mathematician Benedetto Scimemi has translated the musical language of the inverse canon into spatial language, an extensional typical of the geometry of transformations. He represented the melody of a composition by J. S. Bach, with an almost scientific method, in a plain graph where the pitches of the notes are traced as a function of time.
The geometrical transformations are: the translation, the reflection and the rotation that in music correspond to the transposition, the inversion and the modulation. In transposing in a graph the position of the notes in the pentagram Scimemi does not take into account a factor that we could define quantum, which makes that highly precise representation lose its consistency by introducing or modifying

the execution time that determines the music execution in architecturing the form.
Many of the contemporary works are the result of compositions that start from geometric transformations, for example some works by Peter Eisenman. Not only his architectural works but also his texts, especially the one dedicated to Terragni, where, through decompositions and redesigns, applying a methodology of critical and textual reading profoundly different from the historians of the time, he traces a theoretical manifesto that is more in support of the his works freed from space and time that a true manual of architectural composition.
The same Eisenman, in 1989 in a paper on Le Corbusier, states that the changes refer to cultural modifications, metamorphoses are determined by technological progress, new conditions of use and new areas of action. When Le Corbusier uses simple geometric solids, in addition to using a new expressive language he directs the composition towards an ordered system. Eisenman, instead, in his geometric transformations of plants and sections, experiments what we could define the laws of thought that two mathematicians George Boole and Augustus De Morgan had developed in the nineteenth century: mechanized reasoning that Eisenman manipulates in propositional calculations.
Each element, in the complicated process of transformation, does not have a precise reference or content linked to architecture. Eisenman demonstrates how it is possible to transform an abstract idea into concepts that are not at all abstract. Both in the Scimemi charts and in the Eisennman diagrams, time is considered linear, always the same as a process that from the past, through the present leads to the future. From a quantum, multidimensional perspective, time loses its linearity becoming a spiral where simultaneously past, present and future coexist in an eternal present. In fact, the graphs, the critical readings simply become diagrams from where it is not possible to read the space-time hybridization typical of contemporaneity.
The present time, in this historical moment, is characterized by great confusion from where, in the world debate, terms such as change, evolution, revolution and transformation emerge. We must, however, be aware that we are living a profound metamorphosis that is totally different from experiencing change. The latter foresees a linearity towards the time that is evolution, or an almost sequential transformation, of the vision of the world. While metamorphosis is something very different, it is an event, where time loses its continuity by wrapping itself and turning on itself.
In this regard Ulrich Beck, in the text *The metamorphosis of the world,* emphasizes that the term *metamorphosis* derives from the Latin that had drawn it from the Greek (meta means "change" and morphé "form"), and its key meaning is "change of form". The most fitting synonym is not a reconfiguration, but a transfiguration. Metamorphosis can therefore be defined as a change of primary importance for which a certain thing becomes something else, and involves a total transformation into a different type, in a different reality in a different way of being in the world, to see the world.
In fact, the metamorphic process involves a radical transformation abandoning many of the securities of the past to bring out something totally new. To understand these deep meanings, we must observe and understand what is emerging from the old to perceive the forms and structures that will consolidate in the future. Are we willing to look at the world of architecture in a metamorphic, and therefore non-linear, and non-evolutionary way?
Moreover, the modern was a moment of metamorphosis, I would tend to underline technical-aesthetic, where Le Corbusier first composes, for example, the Villa Savoye inspired by the Parthenon although something new, in that case the building material, modifies the result and the aesthetic possibilities. These are a metaphor of the world, where rationality is not the solution to all problems; on the contrary, it is at the service of poetry which at that time is always performative, while it generates the rules of its interpretation. In this case the villa's metaphor is not mathematical, as we have seen above, but it represents the uses and beliefs of modernity. Villa Savoye is also the manifesto of the five points that Le Corbusier formulated in 1923 in *Towards an new architecture,* but

its aesthetic result is given by the application of reinforced concrete, an economic system suitable for this new vision.
Le Corbusier himself wants Villa Savoye to be a car to move, creating a halo of mystery around it through its shape, its white color, its fluctuating within the landscape, bringing its architecture to become a historical monument. At this point it can be said that time has given a new story to the building and that is why it becomes eternal. The architectural work is timeless and its activity is practiced above all in space. Its formation and creation are not instantaneous, it is a sometimes long and tormented process. We could therefore speak of architecture as a process, clearly evoking the idea of succession of time, of the events of the architectural project, has in itself something monumental, majestic. Time is still conceived as a fourth dimension, also as an architectural work, it is subdivided, like the parts of a building on a given plane in established chronological sequences.
Time, in the metamorphic era, assumes a non linear, sequential but quantical, fractal, multidimensional conception. We need to transform the monumental idea of eternal time into that of dynamic, fractal, liquid, plastic time. It is with the modern era that we begin to talk about time, to include it as a determining variable for human life, thus regarding time as the fourth space dimension. Space is something that can be traversed in a given time, while time is what it takes to get through space. All disciplines, from mathematics to philosophy, have played and have dealt with time and space. Among these we can remember the relationships existing between the acceleration and the distances covered by a physical body of Newton, or the meaning that Kant attributes to the concept of time and space.
For Kant, time is a prioritarian condition of all phenomena in general, it needs a symbolization through space. Space is the necessary condition of our permanence and stability in the world. Subsequently, Kant came to the idea that space and time are so absolute and universal, but not in the sense of existing outside our thinking, but in the sense of being the a priori forms of our sensitivity, that is the pure conditions based on which all men must necessarily, and therefore universally, perceive objects. What among the many possibilities becomes real seems to be determined by consciousness and by the act of observation. The object of our attention becomes reality in our world. At this point, all we see is the version we have focused on simply by observing or placing the first brick of an architectural work we have designed. This is the starting point to understand the design choices in today's landscape. That is where the research on architectural design turns its look.

3. Forms > fragments > drosses

It is necessary to clarify that this path will proceed from the universal to the particular. We will examine the great trends, the emerging demand for change in the social order commensurate with its development; as Franco La Cecla states in the text Against architecture, the central question is whether architects who in their work try to resist the norms of culture typical of contemporary society are engaged in a futile and self-illusion. This means that continuing to pass on modernity, today, no longer makes sense, continues La Cecla, modernity is over, has long since retired to its old age, has gone away with its fashion, and architects prolonged its agony. Civilizations, cultures, fashions appear and disappear, but the same singularities come and go with them, like invisible waste, to gather the fruits of experience.
Ultimately we should either formulate a new method, or modify the current technique, reorienting interest, focusing attention on architecture and not on phenomena and suggestions that come from the old way of seeing and perceiving reality which today is no longer the one described by the figurative avant-gardes, where one of the founding elements of thought was linear time, as we saw earlier. Then we must proceed by focusing our attention on a theme or concept, proceeding in this way: 1- refocusing attention on events; 2- centralize the focus more on projecting to the future, than on a representing the past; 3- focus the attention on an object without deviations that come from the world of representation of the past; 4- have the ability to get in touch with the meaning, the subjective world of the emerging reality and to evaluate it and not to avoid it.

4. Space > instant > avatar

In order to understand the transition from the old to the new, we must open a parenthesis to evaluate what happened from space-time-architecture of Giedion, to space-time-information of Metapolis up to space-instant-avatar. According to Zygmunt Bauman, in *Liquid Modernity*, space is something you can go through in a given time, while time is what you need to travel through space. We have seen how time, today, has assumed a different value that is no longer linear, in which the result does not change proportionally to the starting data and the effect is not proportional to the cause. The relationship between time and space is from now on changing and dynamic, not fixed and preordained, quantum.

Rem Koolhaas also points out that time was a design tool, in fact he makes the comparison between the speed that considers equal to the pure movement, devoid of the weight of history, stating that space and speed are the new materials for building the future. Where space has lost its dimension, time is no longer an instrument to go through space, it is canceled by the instantaneousness of events which are mainly cultural and not structural. Where surfaces and materials have only a symbolic value in virtual constructions, and information matters more than function, it is no longer "machine for living", to reconnect with Le Corbusier, but perceptive and sensorial machine, an avatar.

An avatar is a virtual figure, animated and dynamic, able to evolve and change over time; it can transform and change, mutate or hybridize, mixing, and making liquid, conditions and information. In the Metápolis dictionary of advanced architecture, it is stated that more than an image, the avatar is an open trajectory that responds to a programming logic to a basic evolutionary criterion that, however, alters and tacitly conforms, thus acquiring different degrees of complexity and identity: a dog plays, so, like a piano, a dinosaur is a door, a floor contracts like a face, a face is spread in a landscape, a flower breaks a mountain, a tree is a street lamp. We recognize that we are living a new reality, where information technologies encourage a form of living as a network, connected to other networks and in continuous transformation, and in that where architecture and cities must be designed in a totally new and innovative way.

5. Conclusions

Freeing us from theories, or from the concepts that place the present as the starting point and the arrival of a bygone past, a whole series of new dynamics and processes can be perceived, allowing us to understand the continuity and discontinuity of modern time. To understand the metamorphoses we should break with the idea that the events, the patterns of the past, can have a circularity, thus an evolution. Another aspect is historicity; in the present we consider history as the only possibility of transforming the patterns of experience; precisely the inverse canon is not continuity but an assembly of experiences. Thus losing the idea of the future as a continuity that derives from past and present experiences, it becomes uncertain and unknown. Instead, starting from those little resistances of the past in the present, or from the new beginnings, this is where contemporaneity can be found. The architectural project becomes an element of union between material and immaterial influences, between real and virtual, no longer representing Greek perfection but placing the human being and the world at the center of the research, as wellas the current and the daily conditions that may be positive or negative but in any case to which an answer needs to be given. Man, with his body, becomes the protagonist of the space of everyday life that is not linear but quantum. This means that the non-linearity of the event can cause unexpected changes, which is what happens if in the inverse canon, in music, we change the execution time.

CHAPTER #6.07

FRAMING GENDER: WINDOWS THROUGH WHICH FEMININITY CROSSES OVER

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1. Introduction

The window is a threshold, be it for the transition between genders — as will be explained below —, for freedom, for representation, or for concepts of public and private. It is also a mechanism for framing and classifying, as can be seen, for instance, in Swiss-French architect Le Corbusier's horizontal windows. It is bi-dimensional element that both crops and imprisons images and relations. Regardless of its function, it materializes gender relations by acting as the object that separates the house from the streets, domesticity from the city. It is the object that reveals and safeguards intimacy and domestic life, i.e., male and female spatial disposition.

In cinema, literature, painting or architecture, the window is a feminine place par excellence. Thus, this work aims to discuss the window as an instrument for gender control. Its power derives from observation and from the vulnerability of the observee. History will attribute a technical or functional character to the windows of men, whilst the windows of women are related to affection, hygiene and health.

According to Paul Virilio (1993), the first windows used in dwellings were doors, gateways required to access the reality of an inhabitation. Windows as we know them came later, perforated openings not intended for people to pass through that became popular in rural residences, especially manors and bourgeois residences. A third window is television. Television carries public (outside) space into the house and introduces the false day. As windows became larger, the transition between public and private domains became even more ambiguous, especially for housewives.

Historical and contemporary representations through painting and advertisements, respectively, attribute to each gender its own space: the streets, for men; the home and interiors for women. Montaner and Muxí (2014) state that windows (either literal or metaphorical) are spaces where the cultural and hierarchical model of femininity accesses the exterior: women experience the exterior through the man of the house, observe the streets from the window and on television. Their reality is mediated by others.

2. Different views on windows

2.1. Music

Chico Buarque composed the song "Ela e sua janela" (She and her window) in 1966:

She and her window
So many girls out there
In the street, her love
Must surely be dancing
From her window
She wonders
Where can he be?
Perhaps she will go out on the balcony just once[1].

This song evokes the role of the window as a place for love encounters, courting, and flirting. It is the place from which the woman observes the streets from within her house and meets another tall, dark and handsome stranger ("outro moreno") who now tosses her a wave ("um novo aceno") until she finally goes out into the street, where she can live her life. The woman in this passage is shown as waiting for her love from inside the home until she finally steps out on the balcony, although never leaving her residence.

[1]Original Portuguese passage: "Ela e sua janela, espiando / Com tanta moça aí / Na rua o seu amor / Só pode estar dançando / Da sua janela / Imagina ela / Por onde hoje ele anda? / E ela vai talvez / Sair uma vez / Na varanda."

2.2. Literature

By becoming windowers, young ladies could date whomever they wished, plot an escape with their lovers, and gain strength and ingenuity to resist all fatherly impositions (Machado, 2010, p. 312).

Vânia Carvalho (2008) analyses the novel "The Hand and the Glove" written in 1874 by Machado de Assis for representations of male and female. Describing male and female spaces within the house, the *alcovas*, the novelist distinguishes them quite explicitly: the male room fulfills a social role, it is a place for working, studying, sleeping, and entertaining guests. In the novel, the room is not a place of isolation for men and the window connects it to the outside world (Carvalho, 2008). Through the window, "carriages could be heard" and the gardens can be observed, for the man's eyes look outward. In the female room, the direction is the opposite. The female room is a place of isolation for feelings, fantasies, anger — and overall it is a place that fulfills no shared social role. In colonial Brazilian residences, especially in the Northeast region of Brazil, *alcovas* were spaces for control, where women would retreat at night for safety, locked in against the dangers of house guests staying over for a few days or against the temptations of the outside world. Encounters in a female room would be limited to its threshold, and the interior space reserved for female introspection. Again, the window marks the separation between the public space that is male and the inside space that is female.

2.3. Photography and painting

Women are depicted facing windows in a number of oil paintings, such as *The awakening conscience* by William Holman Hunt (1853-54), *Romeo and Juliet* by Ford Madox Brown (1870), *Muchacha en la ventana* by Salvador Dalí (1925), or *Serenade* by Otar Imerlishvili (1970). Men, however, are often depicted in the opposite way; as rational and intellectual. One example would be Edward Hopper's *Office in a small city* (1953), which depicts a man working at his office desk facing two large openings with an ample view of the city's skyline. Light bathes the office and the man comfortably rests his hand on his desk with an air of confidence.

This theme of women and windows continued to be depicted in the ads common in the North American suburbs developed after World War II. These advertisements showed housewives cleaning windows and looking out the living room window at their children playing or through the kitchen window at a husband coming home after a long day of work. Re-domestication and reconstruction of the family home during this period also brought about some innovative changes to architecture, such as the glass wall in living rooms found at the back of the house facing the so-called "outdoor living room", designed to allow mothers to observe their children while they played on the lawn. Later the free plan of living rooms began to give way to one centered around the television set. "The picture window, therefore, became the interior of the house, which gradually became more and more like a stage – or in 1949, a television – setting" (Kelly, 1993, cited in Harju, 2017, p. 66).

A 1952 photograph depicts Lina Bo Bardi in her Glass House, with her back facing the camera. Her stance in the composition constitutes a formerly male-only profile and asserts her professional position because as Maria Cristina Castilho Costa remarks, one of the plastic resources employed to express a high social status of women was masculinization of female attributes. The architect sports dark pants, a shirt, and a wristwatch. She holds a book in her hands, her eyes resting on the surrounding landscape, on the horizon. Lina contemplates the exterior through her window, a platform of sovereignty. Appearing by herself in the image, Lina escapes the model of the woman as ornament introduced by the 19th and 20th century etiquette manuals.

2.4. Cinematography

Pierre Chenal's 1930 documentary *L'architecture d'aujourd'hui* shows three houses designed by architect Le Corbusier, starring architecture as the protagonist. The scene for the first house shows a man, Le Corbusier, driving to Villa Stein. He enters the house and moves through it quickly towards the terrace, where he contemplates the horizon with a regal

posture. However, in Vila Savoye the character moving through the house is now a woman, and the sense conveyed is quite the opposite. The woman is introduced to the viewer already inside the house: she moves through it delimited by the building and its window frames. When she comes to the terrace, she takes a chair and positions it towards the house, the space she has just exited. The point of view of the film is also inverted, as it is that of a voyeur. She always has her back facing the camera.

Windows also reflect the state of women's emancipation and autonomy, be it at home or at work. A fact that is also explored in cinema. Even if men are inside, their windows will show them the city and the horizon. But women's windows are either inaccessible or far too small to accommodate a view such as this. An example of this can be found in the U.S. TV show *Mad men*, produced by Matthew Weiner. The show is set at an advertisement agency, where characters Don Draper and Roger Sterling occupy offices with large glass *façades*, while the offices of Peggy Olson or Joan Holloway, characters whose positions at the company are more or less at the same level of the hierarchy, had no windows.

When a man is depicted near a window, regardless of whether it is in a painting, photography or cinema, scenery (the city) is always present. However, when a woman is portrayed, the image emphasizes the window and the interior space in which she is found, while the outside scenery is irrelevant; often a romantic and melancholy, and many times generic, landscape.

2.5. Architecture

Vânia Carvalho (2008) states that the presence or absence of windows, the way windows are treated, and with whom they are associated play a relevant role in analysis of physical space and gender. "Architecture is not simply a platform that accommodates the viewing subject. It is a viewing mechanism that produces the subject. It precedes and frames its occupants" (Colomina, 1992, p. 83). With the improvement of construction techniques, windows have adjusted to changes in the ways of inhabiting houses. They are no longer small openings. Windows have now become large glass panes that suggest a new dynamic between outside and inside spaces, sociability and subjectivity.

In 1926, when she designed her summer house in Roquebrune-Cap-Martin, in southern France, Irish designer Eileen Gray reversed sexual policies and gender roles played out in the environments of the household. She positioned her own *boudoir-studio* inside her bedroom, with doors connecting it directly to an outside environment. Her small room — a space traditionally reserved solely for female introspection — now a place of work is surrounded by large horizontal glass windows that draw the landscape completely into the inside environment. The apparent excessiveness of the windows ultimately creates a balance between interior and exterior (Ferreira, 2016, p. 89).

In Villa Mairea, a residence designed by Alvar e Aino Aalto from 1937 to 1939, the windows of Mrs. Gullichsen's atelier view the inside patio of the house and define a visual axis that oscillates between confinement and freedom. On the other hand, the windows of Mr. Gullichsen's office inside the library face the river. They are positioned such that he is able to see the entrance of the house and protect it.

In the residence of dancer Josephine Baker, designed by architect Adolf Loos in Paris in 1928, windows are a form of control enabled by voyeuristic observation: the eye that sees is the eye that dominates (Foucault, 1998, p. 45). At the center of the house was a pool that, like an aquarium, constitutes a box that penetrates the domestic space — "a box inside a box" (Colomina, 2007, p. 220) — and marks the moment of entry into the house. This design aims to create an atmosphere of desire unlike other interior spaces designed by the same architect, where windows are covered with curtains, obscured by furniture and, above all, functional in nature — to let in light and for ventilation.

Mies Van der Rohe's project for Dr. Edith Farnsworth built in 1951 consists of a house with four glass walls, which raises significant issues regarding the client-architect relationship at a time when women oscillated between being objectified figures and emancipated individuals. The resident herself is understood

by the architect to be just another part of the architectural object. The windows of the house reflect this duality: the dismantling of traditional shape and size are pursued to a limit, producing a reverse effect: the female inhabitant loses her privacy and therefore her sexuality and intimacy. Dr. Farnsworth said that she felt watched and exposed, as if she lived in a cage at the zoo. Edith's female body was estranged in her own home. If there is no room for windows, is there room for women?

2.6. The window as a threshold for social differentiation

On the other hand, a window that reveals intimacy can also silence, suppress, and confine women. Paulo Marins speaks of lattices[2] in the City of São Paulo as mediating architectural elements of the colonial period and objects of normative confrontations as of 1808. These openings allowed furtive glances and platonic courtship, while safeguarding women in their respective residences under the care and control of fathers and husbands. Lattice windows were part of the intense need for differentiation in the Brazilian slave society. In Brazil, they allowed slaves to peek into the streets to know the proper time for leaving and entering residences. This is a window that both preserves and mediates social differentiation yet allows for communication.

Another example are maid's rooms — while abundant in Brazilian architectural orders of the 19th century, they were neglected as planned spaces in bourgeois homes. These rooms were historically designed to house female workers. They were built with windows of minimal dimensions or without any openings at all, inciting a discussion on the role of the maid in the domestic program — even in the context of modern architectural movements. House E1027, for instance, presents an overall integration of environments, but one of the three rooms in the basement is the maid's room. This room is exceptionally smaller than any other room in the house. The view from its small window is blocked by a column (piloti). It is the only room without direct access to the outside of the house. The same issue can be seen in Lina Bo Bardi's Glass House, in São Paulo. The living room and main bedroom windows are glass walls, but windows in the utility rooms are smaller and with colonial characteristics. This is repeated in the residence for engineer Carmem Portinho, where the only window in the maid's room faces the inside patio.

3. Conclusion

The window domesticates and dominates the eye. Its design varies depending on numerous criteria, such as different ways of inhabiting, the hierarchization of the environments of a household and gender relations. It mimics the female figure, due to its duality and representation of inequality. This paper uses the window as a starting point to understand the construction of gender within the physical space of the house, as well as its presence in the urban space. Could the window be the mechanism responsible for transforming streets and houses into such binary and antagonistic spaces? Windows mediate multiple domestic spaces and arrangements, along with various practices of the streets. They reveal a metaphor of social relations oscillating between privacy and transparency. This dichotomy transcends architecture.

Windows provide an understanding of the domestic environment and, when looked at from the perspective of Gender Studies reveal how female architects or clients connected to these spaces influence the shape, size, and positioning of these openings (ribbon windows, *facade* windows, and the absence of windows). Thus, discussions about gender are enriched when the window is included in the analysis, especially when we consider that architecture, like gender, is a social construct. When looked at from an architectural, technical, conceptual, and symbolic perspective, windows can be understood as an architectural event.

Windows are always redesigned when domesticities undergo changes or as new subjectivities begin to emerge and, consequently, as the way women use domestic and outside spaces undergoes changes. By defining windows, one can understand the state of women's autonomy, for the window is both

a *dispositif* of incarceration and of freedom, according to the degree to which women oscillate in between tradition and emancipation. The balance between intimacy and exposure in architecture lies in its openings. A presence or absence of windows dictates the ways men and women behave in a space, as they are a product of complex relations within the home, as well as sexuality, gender, race, and class. Furthermore, as supported by the examples above, they are also a product of the relationship between those who inhabit and those who design a house. Thus, windows in architecture reflect the way interaction, mediation, and negotiation take place in a society.

> "As a (permeable and transparent) border, which allowed insights and views of the interior and the exterior, the window epitomized the suburban sentiment of one's selfpositioning in the public sphere – on one's own and yet in relation to, and visible for, the world. The boundaries between public and private spaces increasingly blurred and became the subject of complex social and cultural debates" (Harju, 2017, p. 67).

The window is not only a border separating public from private, it also separates spaces of masculinity and femininity. It is through the window that differences in the direction of gaze can be noted — either towards the outside or towards the inside. In architecture, the practices of vigilance and observation can be related directly to these openings. The window and the female gender share the same nature: duality.

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CHAPTER #6.08

HIDING ARCHITECTURE: THREE STRATEGIES TO ERASE THE ARCHITECTURAL OBJECT IN XXIST CENTURY

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1. Introduction

According to some dictionaries architecture is the art of designing and constructing buildings (Pearsal 2001). According to others it is instead a discipline concerned with the realization of spaces that humans can inhabit (Architettura n.d.). There is a meaningful difference between these two definitions. The former points to the architectural object as the final goal of design. The latter rather points to people, society and places, considering the object a means to achieve broader results. In the first case, all design has to worry about is to create buildings that stand out for their intrinsic qualities, such as the precision of the form, the elegance of details, the perfection of technical solutions. In the second case it also has to be concerned about how buildings interact with their surroundings and local communities. The first approach leads to focus on formal, aesthetical and technical qualities of the object, that concern how this is *per se*, more than how it relates to its context. The second approach leads instead to provide equal importance to the relational qualities of the object, that describe its capacity to fit in with the surroundings, to become a part of them and to establish positive relations with the locals (Del Val 2009). If the protagonist of design is the place, then sometimes it may prove necessary to design a building that is the most gentle and unobtrusive presence; a building that blends with the context to the point of becoming invisible. There are cases where, in order to benefit the place, the object has to be erased (Kuma 2005). In XXIst century architecture this understanding has gained a particular relevance. Over the last twenty years, it has become increasingly important an approach that consists in giving all the protagonism to the place and, at the same time, in submitting the architectural object to unusual renounces. This could mean designing a camouflaged building not to disrupt a beautiful, yet fragile landscape; or an anonymous one that fits naturally into its context; or even doing almost nothing, if the intervention site doesn't seem to require great changes. Camouflage, anonymity and minimization are the strategies that contemporary architecture uses more often when circumstances ask for the quietest and most silent intervention; each one of them constitutes a different way to address the needs of a place and to make the architectural object disappear.

2. Camouflage

Camouflage provides a way to build in those natural surroundings that seem to ask more for protection than for alteration. Last decades have been marked by a profound change in the collective perception of the territory; art critic Gillo Dorfles called *it horror pleni* (Dorfles 2008). Contemporary society is characterized by the proliferation of artifacts, objects, images, and signs of human activity of all kinds. Horror pleni is the growing awareness of this situation and of the fact that the pauses from the artificial realm will become in the future even more uncommon. There is a collective rejection of the idea of a world made

Figure 1. Kirosan Observatory (Kuma, 1994) Source: http://kkaa.co.jp

Figure 2. Madinat Al-Zahra museum (Nieto Sobejano, 2009). Source: http://www.nietosobejano.com

up entirely by artifacts (Repishti 2008); as a result, natural and rural landscapes are perceived with increasing frequency as public assets that should be kept intact, if possible. Because of this, some places pose themselves to architects as a problem very hard to solve: the erection of a new building seems inappropriate, since it could compromise their fragile balance; not to build, on the other hand, is a decision that is not up to the architect. The observations made by Nieto Sobejano, when they had to design a museum in the Sierra Morena (Nieto, Sobejano 2009), and by Kuma, when he had to build an observatory in Mount Kiro (Kuma, 2006), are good example of this struggle: they say clearly that the best thing to do, in their respective places, would be not to build at all. It is no coincidence that they eventually realize invisible interventions: the museum built by Nieto Sobejano is an hypogeum structure whose colors blend with surroundings; Kuma's observatory is an half-buried object covered with soil and grass. The latter shows a particular application of camouflage in the context of contemporary architecture, which could be called naturalization: the design of buildings that looks like natural elements more than artifacts. Naturalization allows design to build without apparently adding objects, carrying out interventions that do not seem artificial and do not seem to be there, even if they are. This is the case, for instance, of Antinori Winery, built by Archea on Tuscan hills, a hypogeum building whose roof is covered with vineyards. There is no outward hint of its existence, except for some cuts into the ground that let the sunlight in. But naturalization can also be carried out in other less radical forms; it can imply, for example, designing buildings that seem natural because of the features of their envelope. Covered with vegetal or mineral textures, the skin of the building converts into a mask and an invisible cloak. It becomes a mask, since it provides to the object an alternative identity, that of a natural element. It becomes an invisible cloak, since by doing so it also makes it disappear. A valid example of this strategy is Lyuan library, built by Li Xiaodong in a forest not very far from Beijing. Situated in a clearing in the woods, the library is a rectangular glass box covered with locally sourced sticks. This cladding is meant to shade the sunlight, but even more to conceal the building. Precisely for being a camouflaged glass box, Li Yuan library testifies

Figure 3. Antinori Winery (Archea, 2012) Source: http://www.archea.it

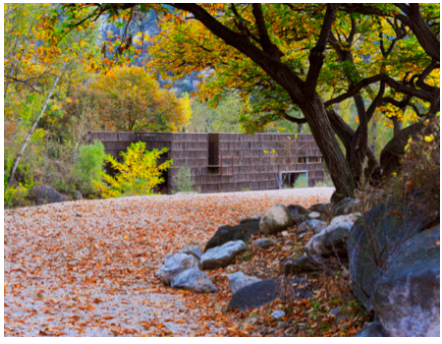

Figure 4. LiYuan Library (Li Xiaodong, 2011). Source: http://www.lixiaodong.net/

of the changes architecture is going through in its approach to landscapes. Some of the most famous realizations of Modern Architecture were glass boxes intended to let the people inside enjoy the landscape freely. Building a glass box in a beautiful landscape only to cover it, as Li Xiaodong does, is a decision that probably most modern architects would not understand; the reason to act this way lies exactly in the change of sensibility towards the territory previously mentioned. Due to this, in some circumstances the most proper architectural choice, for the sake of the place, seems to be to hide the object.

3. Anonymity

While camouflage can lead to the actual invisibility of the object, anonymity results instead into a disappearance of another kind. The aim of the strategy of anonymity isn't to make the object invisible, but rather to help it go unnoticed. The word anonymous, when associated with a building, seems to imply a negative judgment about its overall value. Over time, the word ended up indicating something lacking outstanding qualities and, therefore, worthless; an anonymous building, in this sense, would be one devoid of specific architectural merits. But another understanding is possible; anonymous originally meant nameless, and currently indicates also the absence of the author's name. If applied to architecture, this other meaning can be used to describe the role of the individual author in the design process. There are buildings whose characteristics point directly at the *modus operandi* of the authors, and others whose logics are clear even without knowing the names of them and their architectural preferences (Grassi 1984). Understood in this way, anonymity is the condition of those buildings that seem to be the product of a collective authorship; as an architectural strategy, it describes the design of buildings where everything sound familiar and well-known and that therefore do not draw attention to themselves. This discretion distinguishes the work of some of the most relevant contemporary architectural practices such as Sergison Bates and Lacaton Vassal. In their buildings it is often possible to recognize those principles through which the strategy of anonymity unfolds: the adoption of

Figure 5. Bethnal green studio house (Sergison Bates, 2004) Source: http://sergisonbates.com

Figure 6. House in Cadaqués (Sergison Bates, 2011) Source: http://sergisonbates.com

Figure 7. Housing in Saint-Nazaire (Lacaton Vassal, 2011). Source: https://www.lacatonvassal.com

common materials and techniques, the use of formal arrangements that are neither exceptional nor singular, the design of sober facades. Sergison Bates use to realize low-key buildings of simple appearance. In many occasions, to better blend with the surroundings, the outward aspect of their interventions subtly evoke, by analogy, local architecture. This is the case of Bethnal green studio house and of the house in Cadaqués. The first, located in London, is a mixed use building that houses two apartments, the studio of an artist and the space for a therapy practice. The main characteristic of the context is its industrial past, recalled by many of the buildings existing in the area. In order to make their intervention fit, Sergison Bates decides therefore to give it *"an ambiguous form, that can be read both as an urban house or a simple industrial shed."* (Sergison, Bates 2004). The house in Cadaqués is in a very different situation, being located in a coastal town in Catalunya. Still, the strategy to let the building blend in is the same. The house adopts some of the formal and visual characteristics of local architecture, and by doing so achieves a high degree of congruence with the context, which is intended to facilitate its integration. One of the more evident qualities of Lacaton Vassal's buildings is precisely their capacity to go unnoticed. Nothing in their architectures appears too loud, nothing ostentatious; each aspect of them seems instead quite plain and straightforward. The low-income housing that they realized in Plaisance, a neighborhood of Saint Nazaire, provides a good example of their approach. Here Lacaton Vassal built 53 semi-collective apartments of three different types, distributed in three parallel blocks covered with polycarbonate and aluminum sheets. As an act of respect towards the context, these blocks are carefully laid out not to prevent the view of a nearby park to surrounding buildings. This is a project that in no ways tries to draw attention, quite the contrary, and that stands out more for the intelligence of the overall approach than for its visible features. In projects like this, anonymity is a way to properly calibrate the intervention without overdoing, understanding that in some cases keeping a low profile might enable architecture to strengthen better relations with the place.

Figure 8. Léon Aucoc Square. Source: https://www.lacatonvassal.com

4. Minimization

Sometimes properly calibrating the intervention can mean doing very little. Architecture knows no operational pattern that works in every single situation; it is instead a discipline where circumstances play a major role (Till 2009). In some cases it may prove necessary to do more, in other to do less. Sometimes, it may also prove necessary to realize a minimum intervention or to do almost nothing (N'undo 2017). In the present practice, acknowledging this acts as an antidote to an approach to urban spaces that contemporary architecture inherited directly

from the Modern, the *tabula rasa*, that consists in razing everything to the ground and building something new in its place. While in some situations this approach might result effective, quite often it only leads to realize unnecessary and unjustified modifications. Regenerating an urban space with very few, yet accurate operations is an antidote to *tabula rasa* because it shows the potential to deal with the city in the opposite way: by protecting those spaces that seem to be just fine and reactivating the others without disrupting them. Far from being simple, this approach requires instead more intelligence and spatial ability than the *tabula rasa*. As Jane Jacobs wrote, designing a dream city is easy, but rebuilding a living one takes imagination (Jacobs 1958). Minimization is a strategy that can be developed in many ways. It may imply, for instance, opting for inaction and doing literally nothing. In this respect, the most significant example is the work carried out by Lacaton Vassal in Léon Aucoc Square. Lacaton Vassal had to design a project for this square in the context of a broader plan for the embellishment of many places of the town. Having studied the site and how local community lived in it, they proposed to leave it as it was. Léon Aucoc Square, they explained, possesses the *"the beauty of what is obvious, necessary, right"*; it is a very quiet place where people feel at home (Lacaton Vassal 1996). They suggested not to make changes because nothing there called for serious modifications: neither its formal characteristics, since the square was already beautiful, nor its social life. Most often minimization implies doing actually something, such as realizing ephemeral transformations on an urban space to reclaim it. This is the intention that lies behind Estonoesunsolar, a program of urban regeneration carried out in Zaragoza by Grávalos Di Monte since 2009. Over the years, *Estonoesunsolar* allowed the reactivations of dozens of vacant lands in the city, always through minimum and temporal interventions. The project they realized in calle San Blas 94 converted an abandoned lot into a small botanical garden. This was achieved mainly through two operations. One was the collocation, in the center of the lot, of a green carpet made of wooden pallets that housed

Figure 9. Calle San Blas 94 (Grávalos Di Monte, 2009) Source: http://gravalosdimonte.com

Figure 10. Microyuan'er (ZAO Standardarchitecture, 2016) Source: http://www.standardarchitecture.cn/

distinct variety of seedlings. The other was the construction of a light structure filled with hanging plants. But the strategy of minimization can also result in the realization of permanent, but very small interventions in problematic spaces of the city. In such cases doing almost nothing enables architecture to protect and regenerate at the same time, finding a point of balance between the need to produce those changes that may improve the condition of the place and the intention to preserve its most prominent qualities. In last years, ZAO Standard architecture built a series of public micro-architectures in Beijing's *hutongs*, ancient neighborhoods often demolished to make room for the modern city. In order to show that *hutongs* could play a relevant role in XXIst century Beijing, ZAO implemented a strategy that consisted in regenerating some of its courtyards through the insertion of collective facilities, intended to attract people living outside and to give a reason

to stay to those still living there. One of the projects carried out by the studio, Microyuan'er, is located in a courtyard characterized by the presence of a very old ash tree. To convert it into a place of interaction between the locals, mainly elderly people, and the kids of a nearby school, ZAO built a 9m^2 children's library and a 6m^2 mini art space that the children could also use to climb up the tree.

5. Conclusions

Designing a building is a process involving a large amount of decisions, each one of them making a contribution to the final result. Not all of them, however, are equally important; some have a bigger impact. There is one decision which all the others depend on, and that, therefore, has a special relevance: it is the decision whether to consider, as the true protagonist of design, the architectural object or the place. If the ultimate aim is to realize a beautiful standing object, then hiding it does not seem to be the most proper choice; it can be rather dismissed as a sign of shyness that in no way helps architecture fulfill its purposes. If the aim, instead, is to shape places that facilitate individual and social life, then in some occasions hiding the object may be a sound and reasonable choice: not a sign of shyness but a demonstration of courtesy. Each place is unique and has its own specificities, strengths and weaknesses; each one asks for a tailor-made intervention. Some of them call for the design of a striking piece of architecture, others for neutral buildings; some call for interventions that hide away. The point is to be able to read carefully every situation and implement the most appropriate strategies. In many ways such strategies as camouflage, anonymity and minimization help architecture take care of places. Camouflage makes the building invisible when this is the best option in order to preserve a beautiful landscape. Minimization allows architecture not to undo humble, but important spaces of the city. Anonymity is a form of courtesy too when it is intended to facilitate the insertion of the building in the context. These operations are indeed very different. Nonetheless, they all are expression of a caring attitude towards surroundings. They allow architecture to treat the place with kindness, as if it was something fragile that could break up if not handled, precisely, with the utmost care.

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CHAPTER #6.09

THE SUBLIMATION OF THE ORDINARY. A PHENOMENOLOGICAL ANALYSIS OF THE GUGALUN HOUSE. PETER ZUMTHOR (1990-1994)

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1. Introduction

If we look at the professional career of Peter Zumthor (Basel, 1943), we can think, if we don't go further, that the Gugalun House – a simple extension operation of an old country house built in 1706, with a modest program, is –apparently- a "minor" or a "secondary" work, which could be framed within his first works as an independent architect[1]. However, -as we will try to clear later-, it could be that this small architectural project of extension of a house in the Canton of Graubünden, contains -in essence- the concepts that later develops in his mature works; that led him to the international scene after winning the Mies van der Rohe Award for European Architecture in 1999, and ten years later, the Pritzker prize.

If we delve into the project and the house itselves, it reveals concepts whose interest transcends the spatial definition of it, and is essential an analysis beyond the visual. The architecture here is also experienced by the rest of the senses, decanted through the Memory, despite the apparent simplicity of the work. Zumthor has the ability to place the Man at the center of his architecture -the perception of it-, ahead of "things", in line with Merleau-Ponty (1945) for which the most important of perception is the own subject.

2. Lanscape and Memory

The place where this house is located, a beautiful Swiss valley of the canton of Graubünden next to the village of Versam, is near Zumthor's studio and home -around 25 kilometers-, so the landscape is precisely *own* to the architect, and is part of his daily life since he was established there in 1979 until the commissioning of this house in 1990, influencing it in an intense way, as hinted by Zumthor himself (2010): *"I work surrounded by mountains in a village of Graubünden; I work from that place, I live there. Many times I wonder if this influences my work, and it does not displease me to imagine that it could be like that."* A place dotted with this type of dispersed constructions linked at the beginning to the work in the field, made of wood and covered with gable roof, without physical delimitation between the different properties, arranged with popular wisdom before the abrupt topography; a place linked, therefore, to that intimate relationship between the landscape and the Swiss national character, an idea already developed by other authors such as Alonso de los Rios (2015), which evokes the most landscaper reflections of Unamuno (1922), for whom each landscape is a determining factor in the life and destiny of Man.

Also, the theoretical thought of Zumthor (2010) has an intense relationship with the memories of his childhood and with his memory, as he himself states: *"Some of the other images have to do with my childhood. There was a time when I experienced architecture without thinking about it. Sometimes I can almost feel a particular door handle in my hand, a piece of metal shaped like the back of a spoon. I used to take hold of it when 1 went into my aunt's garden. That door handle still seems to me like a special sign of entry into a world of different moods and smells. I remember the sound of the gravel under my feet, the soft gleam of the waxed oak staircase, I can hear the heavy front door closing behind me as I walk along the dark corridor and enter the kitchen, the only really brightly lit room in the house. (…) Everything about this kitchen was typical of a traditional kitchen. There was nothing special*

[1]Zumthor received his first job as an Architect in 1968, at the Heritage Conservation Department, at the canton of Graubünden, but he didn`t open his own studio in Haldenstein until 1979.

about it. But perhaps it was just the fact that it was so very much, so very naturally, a kitchen that has imprinted its memory indelibly on my mind. The atmosphere of this room is insolubly linked with my idea of a kitchen."

3. Matter, Perception and Emotion

As it has been said, Zumthor received this commission in 1990[2], with an inderterminate program of needs, since the main objective of the action was to make an extension without losing the charm of the original house, which originally had a typical main room of this class of constructions called *stube*, facing North -an atypical orientation for this type of rooms-, and that gave its name to the house: Gugalun, because it looks at the moon.

The access itself, already existing, a narrow path that wound down and hid the house from the road, almost forced him to a subtle action that brought Man closer to the mountains and the nature that surrounds it. The original house was composed of two bays, perpendicular to the slope, of which only the frontal one could be preserved -the north façade remained with its primitive appearance-, which could be stabilized through a reinforcement of the foundation that stopped the collapse and it contained the sliding. The back bay, due to its poor condition, had to be replaced. This was composed of a semi-basement and two floors, with the aforementioned *stube*, kitchen and bathroom located on the ground floor, and three bedrooms on the upper floor. Its foundations were made of stone, and its construction method was based on a traditional wooden wall system called *strickbau* made of prismatic pieces of solid wood, one on top of the other, with singular intersections in the corners.

The intervention, from the small text written by Zumthor himself[3], to the sketches and plans (Figure 1), is subtle: modesty, intimacy, dense atmosphere, a roof that unifies the old and the new. A decidedly humanized architecture that contains, in addition to what is necessary to meet the physical needs of the inhabitants, the ability to hold the identity[4] of the place and its inhabitants. An architecture that wants to be part of its environment[5].

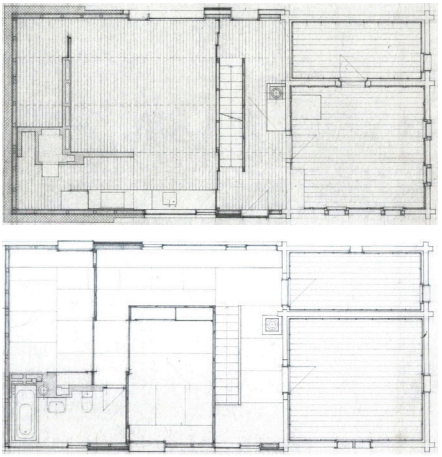


Figure 1. Original Plans of the house Gugalun house. At the left, the ground floor.

The main action is concentrated in the new bay, with its delicate connection with the primitive frontal bay, -which retains its original holes to the north face, looking at the moon-, in which the aforementioned original *stube* is maintained. In this connection, the original difference in height is respected. As it could be foreseeable, the levels of the old and the new are not equalized, but the great 30 cm step is maintained, which praise the original construction and shows respect and special sensitivity for what exists, in addition to maintaining the uniqueness of this space, which is the central element of this type of housing. In addition to this space, the new

[2]Zumthor was the second architect contacted by the owner, a doctor with a vast knowledge in art and architecture named Peter Truog, since the first proposals made by the architect Rudolf Olgiati, who wanted to raise the house in order to open it to the South orientation, did not like to the client. For more information on this, see Alonso de los Rios (2015), p.162.

[3]See Durisch, T. (2014) ed. *Peter Zumthor. Buildings and projects. Vol. 2* (1990-1997), p. 9-21. Zurich: Verlag Scheidegger & Spiess AG.

[4]See Pallasmaa, J. "Identity, intimacy and domicile. Notes on the phenomenology of home", 1994, in Pallasmaa J. *Habitar*, Gustavo Gili, Barcelona, 2016, p. 16-18.

[5]About the concept of "Architecture as an environment", see Zumthor, P. (2004). *Atmospheres. Architectural environments. Surrounding objects*. Barcelona: Gustavo Gili, p.64.

configuration includes the kitchen and pantry on the ground floor, as well as the access and circulation area; and on the first floor, two new bedrooms that are added to the two that remain on that floor.

The new access is located on the east façade, in the area of the new bay, with a vocation to go unnoticed - it is not emphasized by any element, as if it was strange to receive visitors - without a greater role than a change in the direction of the wooden boards and their placement to the exterior plane of the horizontal elements that make up the new construction system of the façade. This access, together with the large exit opening to the newly created terrace in the west area, generate a new transverse directionality of the house with great naturalness, without needing to be placed right on the edge of the change of material, and allowing two things: on the one hand the inhabitant conquer the landscape through the generated interior-exterior spatial continuity, and on the other hand break the strong longitudinal spatial directionality of this type of housing, expanding it transversally without needing to modify its volume.

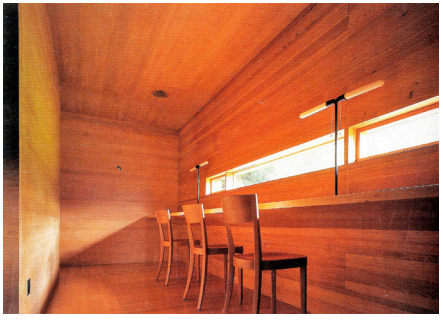
The terrace is one of the most interesting elements of the architectural intervention, where the volume of the house, geometrically controlled, on the similar way of this building typology houses, hatches and denotes here the difference with the others. An element that, accentuated by its horizontality in front of the abrupt topography of the land, wants to penetrate into the landscape, and also, wants to facilitate the landscape to penetrate the house, by generating a spatial continuity with the exterior through the large hole -the only one of those dimensions in the whole house- (Figure 2). A horizontal plane –a platform- is generated to the west of which not all its surface has a vocation to be used, delimiting the useful part by means of a light railing of very thin folded tube. The terrace only coincides with the new bay, while the horizontal plane expands to the north to shelter under it the wood that will be used as fuel for heating, flying over the valley and emphasizing the appropriation of the landscape by the house.

Figure 2. Gugalun house. The terrace (bottom) and the East façade with the access (top).

The volume, as it has been said, is unitary and compact, maintaining the typology of the area, although it was tried that there were sensitive differences that placed the action at the end of the 20th century, such as the simple zinc cover (which helps the house is read as a unitary element), or the construction system of the enclosures.

The respect that is appreciated to the traditional method of *strickbau* is total, but interpreted in a contemporary way. Wood elements are used, developed by Zumthor himself exclusively for this house consisting of two wood boards placed in parallel, between which is introduced a thermal insulation, and a series of horizontal elements of solid wood that, looking like eaves, they get, that the new enclosure has the same width as the primitive *strickbau*, generating an intense dialogue and full of respect between the old and the new. These horizontal elements directly face -without transition elements- against the vertical crosspiece of the *strickbau* of

the primitive bay, needing only the solidary union of the old and new parts to provide continuity to the set, flying the horizontal elements a little more on the old wood to sign the respectful and, at the same time, contemporary link. In addition, according to Pons (2014), these horizontal elements help to improve the thermal behavior of the façade. The system of horizontal eaves leans naturally on the upper part of perimeter concrete walls that protrude in a staggered manner on the ground, and which, in addition to the containment structure, allow the boundary between the house and the ground.



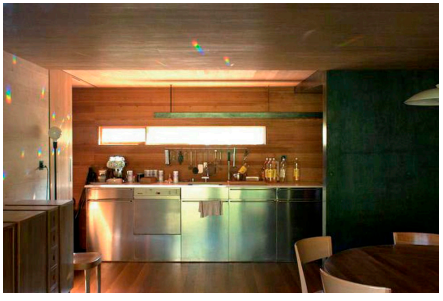


Figure 3. Gugalun house. Place of study (top) and the kitchen with a narrow hollow (bottom, photo Silvia Alonso).

The holes in the house are also related to the construction system of the façade. They are free located, respecting the dimensions of the horizontal eaves, -between them or according to their dimensions-, but with enough freedom to provide to each room of the house light and ventilation that is considered appropriate, and always with Man as the center of architecture. Thus, we see how the hollow of the kitchen runs from side to side, as the study space on the upper floor one, always at eye level - whether the activity is standing as in the first case, or sitting as in the second one-, incorporating a portion of delimited landscape that accompanies the activity, whose depth due to the eaves emphasizes entrapment and connection with the horizon, framing the landscape and producing its activation (Figure 3). The narrow holes are delimited between one of the lines of horizontal eaves of the new facade, with enough flexibility to take multiples of this unit when necessary (bedrooms, living, etc. ..). The darkening system if you modify the original, going from folding system to sliding one, emphasizing with naturalness the new over the old.In the interior, the complete covering of the spaces made with wood generates a space in which hapticity is one of the protagonist attributes. Its materiality fulfills the function, sought by Zumthor, of a dense atmosphere, whose counterpoint is the black exposed concrete wall which will be discussed below. Smooth wood, with the joints hidden in the same plane (except for what happens in the primitive rooms of the house, that allows subtly framing the currently intervention respecting the original), and with the care of placing the pavement planks in a direction parallel to the slope and those of the roof perpendicular to it. This last detail links with the oriental references that are found in the house, which boost the humanization of the space and its connection with nature. In this sense, in the project plans we already find a declaration of intent, showing a kind of modulation or standardization of the floor pieces and wall panels similar to modulation that can be found in Japanese houses (like shoji screens), as if it were pieces of tatami and rice paper closing, which dialogues with the rhythms -different - created by the eaves of the façade. The large sliding doors that delimit the two new bedrooms and which are hidden inside the new wood walls (Figure 4) also contribute to that spatial fluidity, also oriental, from whose source Wright, Neutra or Taut drank; a culture that generates spaces to serve as a stage for the daily life. As Neutra says: *"This standardization of the sliding doors dimensions and the divisions, of the cupboards*

drawers, of the construction of the roof, the edge protection of the balconies and the wooden jars, allowed to the designer, who was also a builder and a carpenter at the same time, sketch his plan in the simplest way. The standard determines the structural details and shapes the life. All activities are subtly and organically integrated with the form which contains them and with the stage in which they happen."[6]

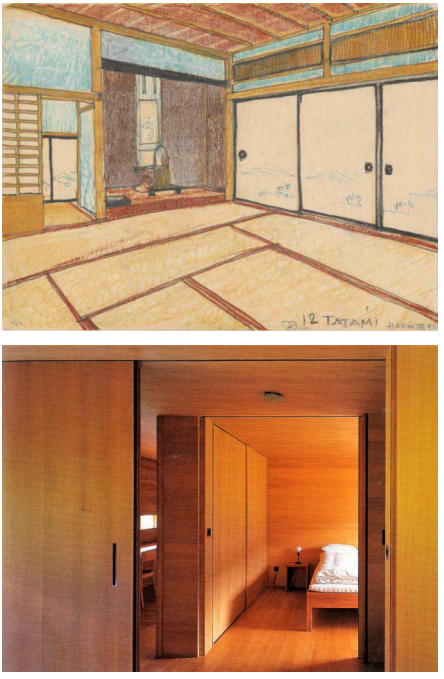


Figure 4. Richard Neutra. Hakone (1930), watercolour (top). Gugalun house, wood finish and big slinding doors (bottom).

There is a "encounter" of this architecture with the Japanese house, which introduces it into a kind of sensory field such as is experienced in the "tea ceremony": the silences or the sounds of the boiling water in the metal saucepans, the connection with nature and with the archaic, the smells, the movements of the ritual, etc. Three different types of wood are used, as is indicated by Alonso de los Ríos (2015): larch for the pavement, alder for the walls, and birch for the furniture in general. The different finishes of the wood -rough touch outside and smooth inside- enhance the reflection of the light filtered through the holows, giving to the house a special ability to be understood as a refuge from the harsh winter landscape. The sensitivity of wood has its counterpoint -which emphasizes it- in the strength of a black exposed concrete wall, which contains all the force of a contemporary, artificial material, contrasts with the traditional construction system and with the natural matter. This "fight of opposites", apparent oriental idea of ying-yang, becomes necessary to understand the subtlety with which one acts in the rest of the house. The areas covered by the wall (which is T-shaped in section), are emphasized using the exposed concrete finish: closing of dining room, kitchen's ceiling and bathroom's floor (Figure 5).

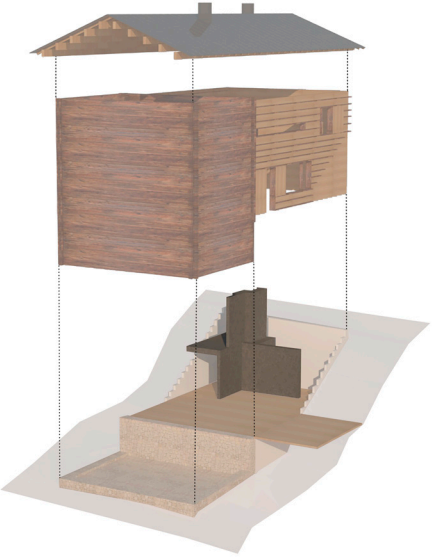


Figure 5. Scheme of black exposed concrete wall inside the house (drawing by the authors).

[6]Richard Neutra: Survival Through Design, from Vela Castillo, J. (2003). *Richard Neutra. Un lugar para el orden. Un estudio sobre la arquitectura natural*. Kora collection, nº13. Seville: University of Seville, p.62-63

In addition, in order to singling this element out, it is committed to be a structural element (which supports the first floor, and stabilizes the house transversely in the overturning's face), as well as to contain the heating system of the house. In fact, the element acts as a kind of "radiant wall" through whose sprats the water vapor -which comes from the boiler located in the basement- goes out. This is an amazing reinterpretation of the olds fireplaces which were the heart of the house.

Thus, in this simple space, a series of central themes of architecture are condensed which, as has been said, and they will subsequently be developed by Zumthor: Man, the matter of the architecture, the consonance of materials, sound and temperature of space, or the dialogue between Old and New. Housing is experienced through the smell, the sense of memory, evoking the aroma of grass or the different woods, whose different kinds, old and new are blended as if it were an infusion of aromatic plants, which leads to the childhood of anyone who has had some contact with nature. The house is also lived from the sense of the hearing, from the absorptions or sound pressures of each material and the conjunction between them, with the crackle of the crunchy wood when stepping on it, through the resonances of the surrounding nature that sneaks through the hollows or in the spaces provided for its serene contemplation, as the essential and horizontal plane that flies over the valley as a terrace. A house that invites, in the own words of Zumthor, to imagine it in silence, or letting the wind do its work. Also this house is perceived, in a very deep way, from the sense of touch, through the textures or hardness of the materials, allowing cross it through the corporeality and density of the interior smoothness of the wood, which filters, slides and reflects the external light in a special form and in different ways - as opposed to the roughness of the outer skin-; or through the smoothness of the "radiant wall" of satin exposed concrete, which delimits the dining room and that leads us to a reflection on the concept of temperature of space, so studied by Zumthor. In addition, the hapticity of the wood is linked with the culture of the place and the memory of the architect himself. Reflections, suggestions, beauty, a house that can be understood as a geode - in terms of Saénz de Oiza - whose interior crystallizes thanks to the embrace of light with matter.

4. Conclusion

Ultimately, with this Zumthor intervention, not only enriches the architecture of his time by overcoming vacuous minimalism, or the creation of spaces of high sensory value, but also introduces Memory as a filter that decant the previous, and makes it physical through the work of the different materials, getting to awaken the emotion of those who inhabit this space. Also, in this small extension there is a real action of construction of the landscape, beyond the construction of an architectural object -which is not an essential condition for building landscape-, Man is placed at the center of this intervention, giving the accurate meaning to build. And it is that, according to Heidegger (1951), to build means originally to inhabit, to shelter, to take care - to cultivate a winery, for example -, for what to build the landscape only requires a human reference that supposes a vision of the world. And this is precisely what Zumthor achieved in this space that celebrates all the senses, and that evokes emotions -even reminiscent of memory- linked to daily life. From our point of view, this architecture contains a valuable conception of the architecture in which Man is situated and its relationship with the landscape at the center of it, and which advances positions subsequently developed in works such as the Termas de Valls (1996), the Kolumba Museum in Cologne (1997-2007) or the Serpentine Pavilion in London (2011), where the concepts cited here continue to be developed more and more intensively.

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7

BLOCK 7: ARCHITECTURAL HERITAGE AND CONSERVATION

INTRODUCTION TO BLOCK 7

ARCHITECTURAL INHERITANCE CONSERVATION: PROTECTION, TRANSMISSION AND FUTURE-MAKING

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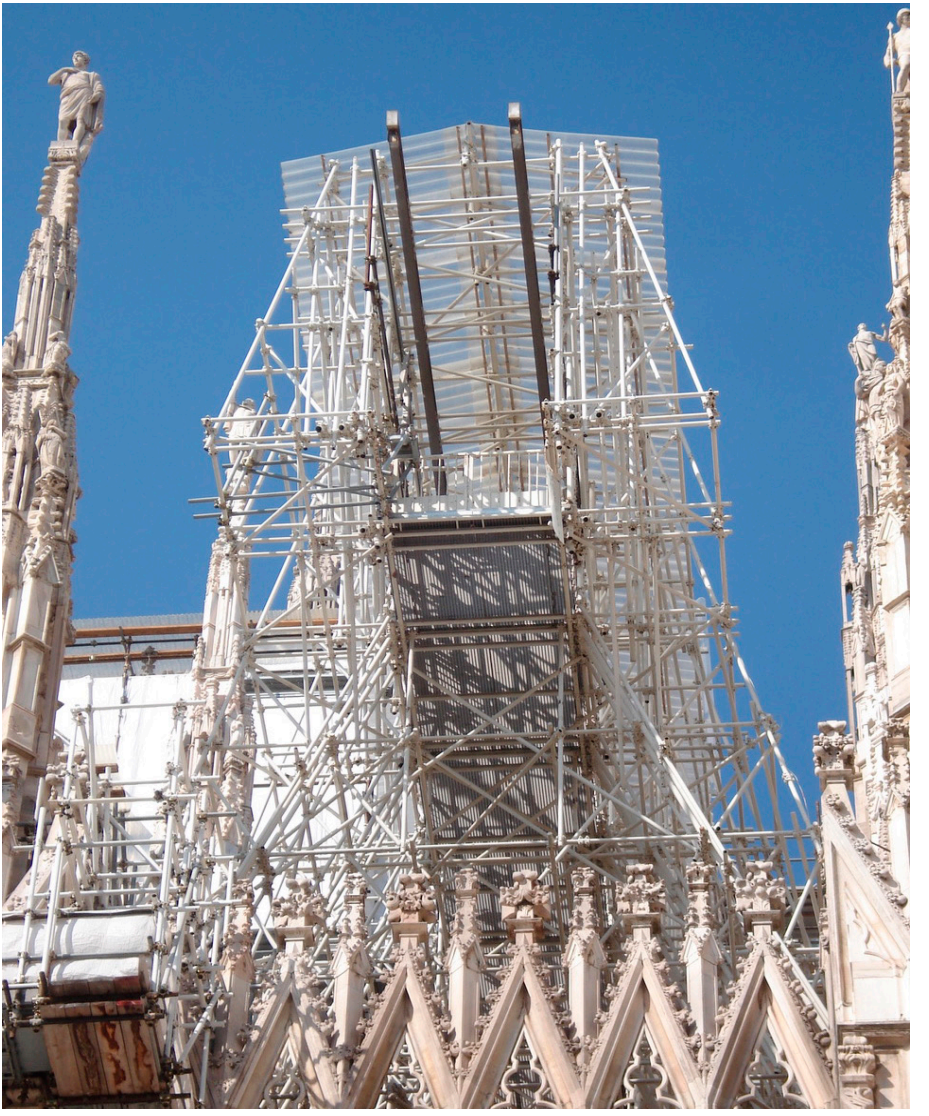

scaffolding for the conservation of the Cathedral in Milano. Photograph credits: Loughlin Kealy.

The place of conservation within architecture is changing rapidly. A decade ago conservation was widely seen as peripheral, an area of expertise to be called upon when the project demanded specialist input: for some it was merely one area of concentration within a profession whose range of competences included working with old buildings as much as designing new ones; for others it was almost an independent discipline.

Today the situation has changed and conservation has become an integral part of the practice of architecture through the European continent. One measure of the change can be seen in the recent analysis of architects' workload in Europe as 51% refurbishment as against 49% new build (Sectoral Study 2016, Architects Council of Europe). The figures include buildings of all ages, those with established patrimonial value and those without. But the trend is clear enough. In the process of integration, architectural conservation has exhibited both the familiar elements of the discipline and the tensions of adapting to its new profile. Most clearly, the relationship between retaining the significance of architectural inheritance and its adaptation for new uses has brought new demands on both the concept of conservation and its function within the procurement of new environments in inherited contexts.

The question about the extension of the concept of heritage and the necessary change of use is evident in the two papers dealing with interventions in modern architecture. In the case of "Re-arch" (7.17), the difficulty of society valuing modern architecture as heritage with values worthy of protection is highlighted, as is the need for the re-use and extension of architecture through interventions carried out with appropriate and careful criteria to ensure that architecture can survive over time. In the case of Valencia's German's school (7.18), the text denounces the demolition of the volume corresponding to the kindergarten, that arose out of the need to extend the building - a way of acting that is still reproduced today in other interventions on architecture that have not been adequately valued and protected.

Given the dual foundation of theory and practicality, it is to be expected that the vehicle for examination is through the case study, and the majority of the presentations in this volume are predicated on such studies of architectural inheritance. The analyses of particular cases are configured in different ways, taking the form of historical studies, of analysis of fabric, contexts or origins and combinations of these. Their primary purpose is to establish the significance of the patrimony in question, but always with the purpose of exploring consequences.

From the historical point of view, it is worth mentioning the case of the tile vault in France (7.02), which highlights the origin of its appearance in France, as a construction system that was created to counter the weakness of primitive wooden structures in terms of fire protection, and the influence that the politician in charge of the Ministry of War had in promoting the use of these vaults in public works of great presence in the city. On the other hand, and under the same concept, but on a different scale, it is worth highlighting the influence of Savoy in Sardinia (7.10) with the introduction of Piedmontese architecture which produced a radical transformation of the city in the 18th century.

From the point of view of the analysis of fabric, firstly we can mention the case of the Royal Garrison Church (7.05), that examines the structural behaviour of the monument in order to understand its stability and permanence over time. Meanwhile, in the case of the church of Santos Juanes (7.07), the structural analysis seeks to understand the peculiar formal configuration that the buttresses bring to the monument and that differentiate it from the rest of the Gothic churches of the time.

From the point of view of the context, the paper about the Industrial Setup of River Molinar (7.11) analyzes the laws of the place to explain the logic that guides the design of the architectures of the industrial complex. These laws derive from water as the motor that feeds the mills and that requires buildings to have a structure capable of supporting loads and dimensions

appropriate to the machinery needed in the industrial system; laws that also suggest that intervention criteria should not focus on recovering the lost material reality, but rather on the constructive logic that governs architecture.

From the point of view of the combination of different factors, it is interesting to highlight the case of the Sinyent farm (7.04) where, through historical, typological and stratigraphic studies, it is sought to recognise the values of an original building from the 14th century, which has been hidden under the strata of time. While in the case of the Murta Monastery (7.06), it is through typological, structural and even acoustic studies that the ruins of what was a monastic complex of great architectural and landscape value are sought to be valued.

At another level, the core of conservation theory and ethics is expressed through internationally adopted statements, so that there exists the presumption of a common base that applies across cultures. The papers presented in this volume draw upon case studies from different countries as well as varying timeframes. One can note, referring back to the theme of change discussed above, that as societies continue to evolve in terms of multi-ethnic populations, this presumption will also come under review: architectural inheritance can embrace different meanings and be subject to appraisal from differing cultural standpoints.

In the case of the Moroccan Medina (7.03), the authors criticise the conservationist policies introduced through colonisation, which have produced on the one hand the fossilisation of monuments and with it the deterioration of traditional fabrics, and on the other hand the tourist overexploitation that has led to a "folklorization" that threatens the way of life and culture of the local population. Against this, the authors defend the transmission of knowledge as a practice for the creation of the heritage of the future, through the study of the Medinas as an example to guide sustainable urbanization in contemporary Moroccan cities.

In the same vein, the chapter referring to the experiences of cooperation with Burkina Faso (7.15), shows the idea of building heritage through the transmission of knowledge of traditional techniques of earthern architecture, adapting them to the cultural needs of the place. Understanding the value of this type of architecture not only as cultural heritage but also and above all for its intrinsic sustainable character of respect for the environment, socio-cultural development and socio-economic development.

As well as developing its theoretical underpinnings, the field of conservation is fundamentally information driven, whether this is in terms of the fabric or of the documentation required to establish building history or significance. Most often, the approach to be taken involves the interplay between information derived from broad categories of sources, placing a heavy onus on information systems.

In the case of the Residential Building Database (7.14), the configuration of a database that allows one to know the constructive-structural state of the buildings in order to respond to municipal rehabilitation campaigns is exposed. It is also difficult to obtain complete and homogeneous information from the information available in various catalogues and archives. However, the political demand for evaluation reports can help to fill these gaps and inconsistencies. In the case of the churches of the Philippines (7.08), the standardization of the collection and presentation of data is shown to be necessary for the proper conservation of heritage, insofar as it presents a complex sum of pathologies that must be treated by a combination of different techniques and interventions that must collaborate with each other adequately. To be useful, these data must be accessible and manageable.

But it is also important to know how to transmit this information to society, so that it understands the value it has and supports its conservation. One way is through activities that promote dialogue between specialists and society, as proposed in

chapter 7.16, through the organization of talks, workshops and exhibitions that raise awareness among the population. On the other hand, in the paper about Éduard André (7.12), the texts written in the magazine Horticole are shown, in which the architect expressed the values of the Parisian parks of Trocadero and Monceau by means of descriptions and drawings. The paper demonstrates the importance of specialised media for the diffusion of knowledge about heritage, even more so if we think of the excess of information to which we are subjected through digital networks. But probably the best way to transmit knowledge is through the direct transmission of one's own heritage, allowing the public to live and experience it. And in this sense, it is worth highlighting the chapter on the lighting of architectural heritage (7.13), which seeks to enhance the night-time visibility of monuments, through an appropriate design of artificial light, putting them in value by highlighting them over other elements of the city.

The field of conservation is so often discussed in purely ideological terms that one sometimes forgets that its primary foundations are both theoretical and practical. It is a field of architecture in which theory is being constantly interrogated by the realities of the inheritance in question, whether it be a building, an urban area or an historic landscape. The fact that broader categories of architectural inheritance are being accorded patrimonial value is certainly reflected in the ACE statistics cited above. The statistics in themselves can mask the continuing issue of obsolescence of buildings and environments. Part of the challenge for architectural conservation lies in ensuring that the understanding of sustainability requirements extends to questions raised by reusing for new purposes, inherited environments of cultural value and their adaptation in ways that transmit their value to following generations – a form of inter-generational justice, perhaps.

In this sense it is considered appropriate to close this introduction with a reference to the chapter about Piranesi and his school (7.09), which presents the influence that the Villa Adriana in Rome had on the great architects who visited and studied it, becoming part of a cultural heritage that was reflected in its most emblematic projects. Analyzing heritage, learning from it, and transmitting the knowledge learned into the future is the best way to keep it alive. Because, as mentioned in the text, "Architecture's history, far from being just a history of shapes, it's fundamentally a history of built ideas. Shapes vanish throughout time, but ideas stay, they are eternal"[1] . The contribution of conservation is to demonstrate that the built evidence of ideas remains with us as a reminder, not just of their origins, but of their contemporary relevance.

[1]Baeza, A. C. (1996). La idea construida. La Arquitectura a la Luz de las Palabras, Madrid: Coam.

CHAPTER #7.01

THE ROMAN BATHS OF MURA IN LLÍRIA (VALENCIA). STUDY APPLIED TO THE THERMAL FUNCTIONALITY OF THE ROMAN THERMAL COMPLEX

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1. Introduction

Edeta is the name of the ancient Roman city currently called Llíria. It is located north of the province of Valencia. He gave name to a very large territory in Iberian times. Its inhabitants became known as Edetanos. Later, after the conquest by the Roman Empire, *Edeta* kept its name and became a municipality of Latin law within the *Conventus Tarraconensis.* This population had a considerable extension having a predominant position in the commerce that circulated from the sea to the interior of the peninsula. In the middle of the second century AD and thanks to the figure of General Marco Cornelio Nigrino, the city lived its maximum splendor both socially and architecturally, building large buildings. Only the testimony of the thermal complex and oracular sanctuary of Mura remains. This large complex is located on the northeast access road of the city and extends over more than 3,500 m2 within close proximity from the city center. It was composed of a double thermal complex, a large *palestra,* and a set of buildings around the oracular sanctuary.

2. Objectives and methodology

The main objective of this research has been to find out what is the ignition mechanism of a roman thermal bath by determining the protocol of ventilation duct openings, fire ignition times, fuel quantities and determine the energetic efficiency when checking temperatures in each of the rooms. The methodology is based on the application of the computer programs FDS (fire dynamic simulator) and Smokeview, which simulate and calculate on a 3D model the equations that define the computational fluid dynamics (CFD), solving the situations generated by heat transfer inside the Roman baths (Tormo, 2017).

3. Major thermal baths

The major thermal baths are a construction that closes the thermal complex by the northwest and occupies an approximate area of 2,100 m2, of which 1,200 m2 belong to the thermal building itself and the remaining 900 m2 to dependencies for the maintenance of the whole and the *palestra*. The thermal building

Figure 1. Reconstruction of the thermal complex from the architectural model of Julian Esteban and Elisa Moliner (Esteban, 2015). Source:Global Mediterranea (2015).

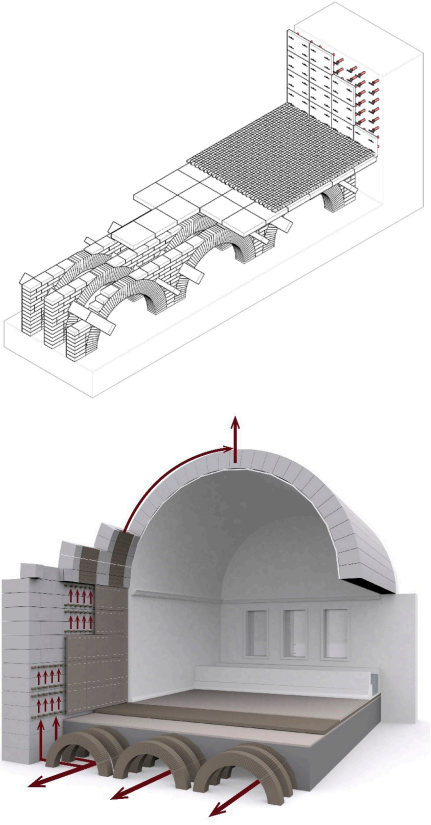
compositivamente consists of two bodies: the rooms of bath and service *(caldarium, tepidarium, frigidarium, apoditerium, cella fornacarii and laetrina)* and the body of entrance and *palestra (basilica thermarum, tabernae, natatio, palestra)*. The entrance for the public was located in the street of the baths where you entered into the first area of the baths, a kind of lobby, which could also be called *accesus* or *ingresus*, consisting of a staircase with seven steps that allows to overcome the unevenness of the building with respect to the street. This hall with a paving of rhomboidal ceramic tiles is a room with a rectangular floor plan (Escriva *et al.*, 1995).

Constructively the walls that define the rooms are made with different techniques. The north wall is of *opus quadratum*, made of limestone ashlars (150 cm of rope by 65 cm of blight and 50 cm of thickness) of local origin, locked in dry, arranged in horizontal courses that settle directly on the natural terrain . The south wall is an *opus incertum*, with small, irregular stone blocks, interlocked with lime mortar. At the same time the east wall is of mixed work, the lower course is made opus quadratus with three large blocks of bluish dolomitic stone of Alcublas (120 cm of rope, 55 cm of blight and 40 cm of thickness), the second course is opus vittatum composed of "sillarejo" alternating blue stone with local limestone (23/24 cm high by 31/32 cm long and 17 cm thick) while the third row is again based on local limestone ashlars . Sometimes there are ashlar siliceous sandstone stones.

The great typology of ceramic material appears perfectly justified according to its functionality and use. From the total of the 12 types found the most singular for their shape are the cunneati pieces, wedge-shaped pieces that superimpose one on the other, generate the arches that hold the pavement of the hippocaustum.

Figure 2. Plant of the Mura complex.. Source:Tormo (2017).

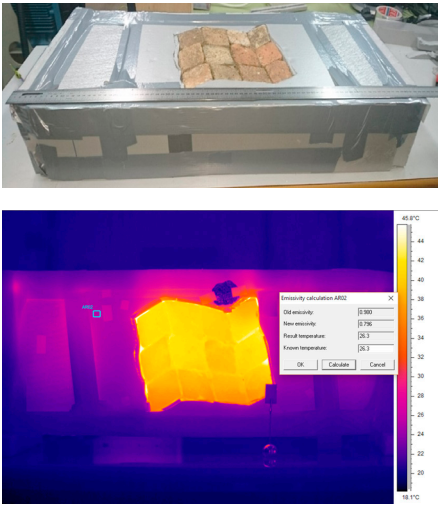
It is important to highlight the construction systems that allow the heating of the rooms of the caldarium and the tepidarium. The main characteristic lies in the need to circulate the hot air to heat by conduction the materials that make up the hypocaustum and the walls, providing a higher temperature in these rooms. The system is simple and based on the principles that govern thermodynamics. From the different ovens located at the ends of the rooms, the air circulation is generated thanks to the convection of the hot air that flows through the spaces designed in the walls and through the ventilation ducts arranged in the walls of each room.



Figures 3-4. Constructive details of the Caldarium room. Source:Tormo (2017).

4. Thermal behavior

Several experiments were carried out to find out the thermal behavior of the materials. The first was to measure the actual thermal conductivity of a piece of the floor of the caldarium. A polystyrene box with an electrical resistance that gave it the equivalent power of heat was produced to achieve a surface temperature of 40ºC. This was achieved by developing an energy balance that allowed knowing the amount of energy losses that occurred on all sides of the box and the amount of heat that the sample had. With this data and by clearing the values in the Fourier law equation, the value of *"k"*, the actual thermal conductivity of the pavement of the hot room, could be obtained.



Figures 5-6. Thermographic study of the pavement of the Caldarium room. Source:Tormo (2017).

Another experiment allowed to compare the thermal behavior of different stones used in the construction of the building. It was found that the stone materials used in the areas closest to the fire were what best resisted the thermal shock and those with high thermal inertia were used for the areas of the walls. With these two tests it was possible to conclude which were the real values, both of the materials and in

particular the construction systems, and with the data obtained to be able to use them later in the computer simulation that determines their functionality.

5. Functionality

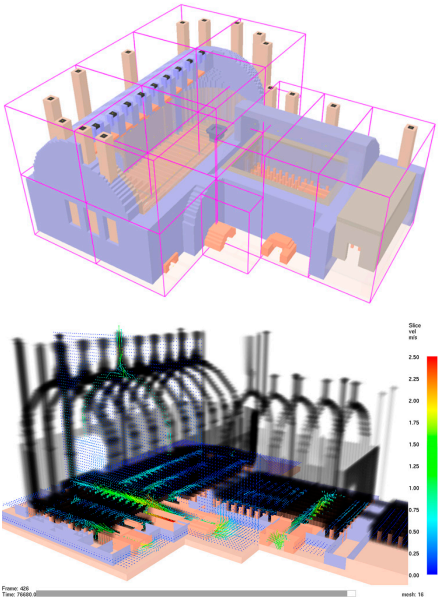
The analysis carried out to simulate an ignition of the ovens in the baths, has been carried out by means of two computer programs that analyze the dynamics of fluids by finite elements and that, according to the architectural model, and the data introduced, can bring us closer to knowing the correct and optimal functioning of the hot rooms of the hot springs. The considered hypotheses will determine for us if they follow the principles on which the thermodynamics and the dynamics of the fluids are based.

The software used in all the corresponding simulations in the investigation has been executed in the two programs (Fire Dynamics Simulator - FDS 5.0 and Smokeview). The first corresponds to a program that simulates and calculates, on an introduced model, the equations that define computational fluid dynamics (CFD) solving the situations generated by conduction, radiation and above all those of convection. The program considers the model as a body formed by cells in the three directions to which their physical properties (such as density) and thermal properties (conductivity, specific heat) are introduced. This data is introduced when considering the cells as solid bodies (the program describes them as obstructions) whose properties are introduced by defining each cell with its nature, that is, with the construction material (stone, brick, water, etc.). In the case of cavities or voids filled with air, the cells are introduced in the same way, simply indicating that said cell corresponds to an "empty" solid that contains air, registering its properties in the same way as in the case of solid cells.

For the solid elements, whose thermal properties have been introduced according to the nature of the building and its materials, the program calculates and obtains for each time interval the results of the temperature in the cell boundaries, the heat flow by convection and by radiation and the speed of combustion. For the elements considered empty (that is, those that are filled with gas) the program determines, among other aspects, the temperature of the gas (in our case, air) and the direction and speed reached by convection of said gas. Once the entire system is modeled, the HRR parameters (heat release rate) of the entire building can be obtained, the behavior of the sensors (temperature and wind direction), and the mass and energy flows through the openings and spaces generated.

The program performs a large mathematical operation with all the thermodynamic equations that affect each cell situation, which it considers as a finite and homogeneous element, and the results of the adjacent cells are implemented. In this way, at the end of the calculation, the result of the hypothesis can be obtained based on the properties of each cell and the contour conditions introduced in the model. It should be noted that the number of calculations and equations will vary according to the size and number of cells. The smaller the cell, the results obtained are more accurate, although there are studies that show that it depends not so much on the size of the cell but on the geometry of the model (Dufort, 2006).

After the calculation of more than a hundred simulations, 13 operating hypotheses were generated based on the results obtained in each of them and establishing what should be the operating protocol of the installation, as well as knowing the temperature that was generated in each one of the rooms and the sequence of openings of the ventilation ducts. It is curious and interesting to know that the start-up of the thermal baths had to follow a sequence of openings according to the course of time, since the simulations showed that having all the vents open, the thermal heating was not optimal, nor efficient.



Figures 7-8. Computational model and results obtained with the SmokeView program. Source:Tormo (2017).

6. Conclusions

The ventilation system of the vaults is unique. The constructive solution used for the circulation of the hot air of the concameratio was not known in any other thermal installation, It has been demonstrated, considering an energy balance in stationary conditions of the analyzed thermal baths, the real values of all the parameters necessary to calculate the thermal conductivity of the suspension, obtaining a value of k = 0.85 W / m K.

The value has been calculated by computational simulation, obtaining values very close to the experimental ones, with which we can affirm that the simulation repeats the real behaviors.

The temperatures in the soil of the caldarium oscillate between 40 and 45 ºC. Tepidarium temperatures range between 34 and 38 ºC. The temperatures of the frigidarium oscillate between 28 and 32ºC.

The communication gaps between rooms were essential in the operation, both those located at the level of the hypocaustum and those located between the different rooms.

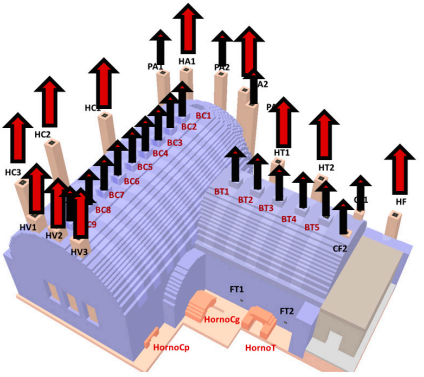
The central oculus of the caldarium fulfilled a specific function: the renewal of the air inside the room (evacuation of hot air and cold air intake).

The estimated energy demand needs about 120 kg of wood per hour in the three kilns in the ignition phase and 60 kg in the maintenance phase.

It has been possible to establish a protocol for openings in the ducts that guarantees optimum operation of the installation.

	7:00	9:00	11:00	17:00	7:00 (+1)	9:00 (+1)	11:00 (+1)
Evento(seg)	0	7200	14400	36000	86400	93600	100800
HV1		A	A			A	A
HV2		A	A			A	A
HV3		A	A			A	A
HC1		A	A			A	A
HC2	A				A		
HC3	A				A		
PA1			A				A
PA2			A				A
PA3			A				A
HA1		A				A	
HA2		A				A	
BC1			A				A
BC2			A				A
BC3			A				A
BC4			A				A
BC5			A				A
BC6			A				A
BC7			A				A
BC8			A				A
BC9			A				A
Óculo			A				
HT1		A	A			A	A
HT2	A				A		
CF1			A				A
CF2			A				A
FT1							
FT2							
BT1			A				A
BT2			A				A
BT3			A				A
BT4			A				A
BT5			A				A
HF		A	A			A	A

Evento(seg)	0	7200	14400	36000	86400	93600	
Horno Cp	140 Kw	140 Kw	70 Kw	0	140 Kw	140 Kw	70 Kw
Horno Cg	280 Kw	280 Kw	140 Kw	0	280 Kw	280 Kw	140 Kw
Horno T	140 Kw	140 Kw	70 Kw	0	140 Kw	140 Kw	70 Kw
	560 Kw	**560 Kw**	**280 Kw**	**0**	**560 Kw**	**560 Kw**	**280 Kw**



Figures 9-10. Functionality results. Source:Tormo (2017).

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CHAPTER #7.02

A WAR MINISTER, TWO IDLE AMATEUR BUILDERS AND AN ECCENTRIC DESIGNER: THE TRUE STORY OF THE TILE VAULTS IN THE NORTH OF FRANCE

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1. Introduction

After the destruction of the Cour des Comptes by a fire in Paris 1737, a sensitivity to the problem of fires was developed in France. In 1754 the Count d'Espie published a brochure entitled *Manière de rendre toutes sortes d'edifices incombustibles ou Traité sur la Construction des voûtes faites avec des briques et du plâtre, dites voûtes plates; et d'un toit de brique, sans charpente, appelé comble briqueté.* As the name itself suggests, it dealt with the possibility of constructing completely incombustible buildings by the widespread use of brick partitioned vaults, collecting the experiences that the author had recently developed in the construction of his own home. The text had a very important diffusion and was reissued (1776) and soon translated into English (1756), German (1760) and Spanish (1776).

2. The Marshal of Belle-Isle and the stables of the Château of Bizy

Tile vault is one of the great Hispanic inventions, whose oldest referents could be found in the area of Valencia, in the fourteenth century. The ease and speed of execution, which does not need support on formworks, led this technique to a great diffusion in a short period of time (Zaragozá 2012). Its implantation in France has its origin when the Spanish territories of Rosellón were yielded to the French Crown by Philip IV in 1659. From that moment on, the technique would be used in several convents in Languedoc, such as those of Castelnaudary (1707) or Toulouse (1713), with numerous examples around 1740 (Bannister 1968). The first civil building of some importance in which tile vaults have been found, beyond the land bordering the old frontiers, in the château of Bizy in Vernon, enlarged by the Duke of Belle-Isle in the 1740s. (González 2004: XXIII). Apparently, Belle-Isle would have known this technique during his stay in Roussillon on the occasion of the military campaigns of 1718 (Redondo 2012, 67).

Charles Louis Auguste Fouquet de Belle-Isle (1684-1761), eldest son of the Marquis de Belle-Isle, was an important diplomat during the reigns of Louis XIV and Louis XV. After distinguishing himself in the wars of Flanders and Spain, he was commissioned in 1727 as governor of the province of Trois-Évêchés, where he created the *Société royale des sciences et des arts de la ville de Metz* and participated in the construction of different public buildings. Promoted to Lieutenant General in 1732 and Marshal of France in 1740, he excelled in the negotiations during the Austrian War of Succession and defended the Dauphine and Provence of the Austrians in 1746, being appointed Minister of State in 1756 (Royal Councillor) and Secretary of State of War in 1758 (what we would now call Minister of War).

Between 1741 and 1743, Belle-Isle ordered to build an elegant and original semicircular courtyard in his château in Bizy (Vernon) as well as some large stables inspired by those of Versailles. The project was commissioned to Pierre Contant d'Ivry, the talented architect which by then was at the service of Prince de Conti, Louis François de Bourbon, also military man and companion of Belle-Isle in the invasion of Bohemia in 1741. An exact contemporary of Gabriel, but less well placed in the architectural hierarchy, Contant lacked the background that sustained the consistency of Gabriel's style to the extent that he seems on close acquaintance a gifted eccentric (Braham 1980: 50). He gained great prestige in his work as interior, furniture and garden designer. Despite he proudly included the façades of Bizy's stables between the sheets of his *Oeuvres* (1769), he tells nothing about his

austere vaulted interiors, built by skilled workers carried expressly from Perpignan by Belle-Isle (Espie 1754: 9-10). However, later writers such as Blondel and Patte (1771-1777: 85-89), and Rondelet (1830: 283-284), appreciate this work, highlighting its imposing annular vaults of 10 meters of span over its 82 cm thick walls (Redondo 2013: 78-80).

Abbey of Penthemont (1747), the château of Arnouville (1750), the church of Saint-Wasnon in Condé sur l'Escaut (1751) or the new wing of the *Palais Royal* in Paris (1753) (Joudiou 1986).

3. The tile vaults come to the press

The recent bibliography has not given enough importance to two articles published in the *Mercure de France* in 1750, quoted very briefly

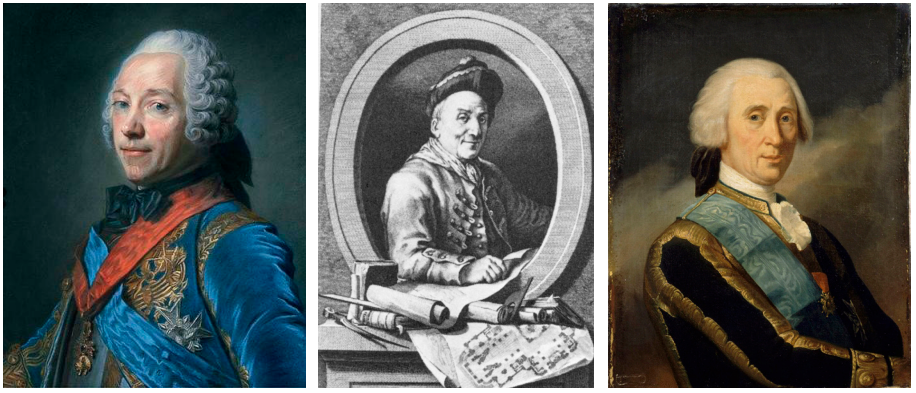

Figure 1. Portraits of the Marshal of Belle-Isle, the architect Pierre Contant d'Ivry and Emmanuel de Croÿ-Solre.

The stables of Bizy then became a benchmark. Nevertheless, other smaller vaults about 5 meters of span, which were also executed in the ground floor for private rooms of the residential building, were soon forgotten and definitely lost as they were demolished and totally rebuilt in the 19th century. These missing vaults were arranged in succession, as a bridge, with two larger pavilions at the ends that served as buttresses. The upper floor and the roof were solved in the usual way, fearing the vault thrusts (La Chèze 1750: 48).

The fame of the discovery reached Paris and the *Académie Royale d'Architecture* itself, where the veteran architect Michel Tannevot (ca.1685-1762) presented in July 1747 a communication praising the qualities of this technique, although the institution refused to endorse it in the absence of experience. For his part, the eccentric Contant d'Ivry might be fascinated by the possibilities offered by tile vault technique, as he will incorporate into other works, as the

in the book of the Count d'Espie (1754: 10-12), because they might have a special significance in the widespreading of this constructive technique. *The Mercure de France* (which initially received the name of *Mercure Galant*) was a long-running French magazine, published between 1672 and 1965 following the line of the *Mercure françois* (1611-1648). The text we are interested in appeared in April 1750 and was titled *"Lettre a M. Remond de Sainte Albine, sur une nouvelle espece de Voûte"* and signed under the initials R.P.D.B.J.A. (216-217). This letter, dated January 27th and addressed to the editor of the magazine, explained that Mr. Geoffroy, architect born in the Isle, in the Venaissin County, had discovered how to build tile vaults without formwork. These vaults were solid and easy to construct; instead of pushing the walls, they held them; they did not need buttresses; they had little height and were almost as flat as the floors. In addition, a house built with vaults of this type up to the roof would be well-protected against fires.

The first trial made by the architect Geoffroy began six years before in the reconstruction of the château of the Baron de Saunier in his seigniory of Violès, two leagues from Orange. There he covered with vaults two large rooms of the ground floor and, over these, he built eight small rooms separated by partitions, covered in turn by vaults that reached the ridge. The text provides some technical details on dimensions and execution, advising for any query contacting the architect, resident in Orange, where he had built many of these vaults.

This letter was answered by another, published in the June issue (pp. 43-55) -although signed on April 24, 1750- by Félix Le Royer de La Sauvagère (1707-1782), chief engineer of the town and citadel of Port Louis and responsible of the fortifications of the south coast of Brittany, as well as historian and archaeologist (Audin 2010). In its writing, the falsity of the attribution of the invention to Geoffroy is denounced, evidencing that tile vaults do also push the supporting walls, although less than the common vaults. He also attached a letter, provided by the Marquis de Rougé (Pierre François de Rougé, 1702-1761), Field Marshal of France who, having heard of the tile vaults, had consulted on his execution to Jean Baptiste de La Chèze (1702 -1757), Lord of Rupigny and chief engineer of the fortifications of Thionville, who had personally witnessed the execution of Bizy's stables. The three characters involved in this matter can be related directly or indirectly to the Marshal of Belle-Isle. Thus, La Chèze was assigned to Thionville, a town that was part of the Trois-Évêchés region, where Belle-Isle was the governor. Both La Sauvagère and Rougé had served during the War of the Austrian Succession under the prince of Conti, protector of the architect Contant d'Ivry and friend of the Marshal of Belle-Isle, which might explain their knowledge of the existence of the tile vault construction system.

The text of La Chèze explains the details of the execution of the Bizy vaults as well as some load tests carried out for the ocasion, and concludes by offering details of interest for those who would like to repeat the experience. It also provides the contact details of the architect Contant, resident in Paris, on the Quai des Orphêvres, on the corner of Harlay Street, and the surveyor Esselin, advising the alternative of directly looking for masons from Perpignan, Montauban or Castelnaudary, in Languedoc, by contacting the Capuchins of these last two locations.

Not enough importance has been given to the contribution of Geoffroy, who probably was the first to dare -in a somewhat risky and unconscious way, on the other hand- to solve with vaults all floors and the roof of the building, since in Bizy the roofs were of timber. In this sense we must point out the fact that the described solution of a vault forming the roof might be behind the first proposals of Jacques-Germain Soufflot to cover the church of Sainte-Geneviève (the plans of 1757 and 1764 can be found on Internet), and of his disciple Nicolas-Marie Potain (1723-1790) for the parish church of Saint-Germain-en-Laye (1765). Likewise, the vaulted roofs of the Halle aux Blés (1763) and the Palais Bourbon (1768), both in Paris, would be on the same line.

4. The turn of the dilettantes

From 1750, after the publication of these two articles, a series of isolated experiments will arise around the construction of these vaults. The best known is that developed by Félix-François, Count d'Espie, at his home in Toulouse, which would serve to write his famous book, published in 1754 and translated into English (1756), German (1760) and Spanish (1776). We will not go into this case, because it is the most well-known (Redondo 2013: 68-72).

In parallel with the experience of Espie, we can mention others such as the reconstruction of the Château d'Aunoy (1750-1754), in the town of Seine-et-Marne, near Paris. The original building was completely destroyed after a fire in 1750 and its owner, Jean-Baptiste Chabert, decided to build a new residence using the tile vault technique both in the floors and the roofs. Chabert was a wealthy Parisian bourgeois, stockbroker, who had acquired the territories of Aunay in 1731. The name of the architect who projected the current building is unknown, but the design is quite conventional and could well be attibuted to a local master or indeed to the same owner. Regarding the constructive

solution of the roof, we know a photograph that suggests a structure formed by a narrow central vault accompanied by two lateral counter-vaults (Moulin 1991). It would have nothing to do with the proposal of the Count d'Espie, published when the Château d'Aunay was already finished. Also by 1750, a parallel constructive tradition seems to have emerged in the city of Lyon, as described by Blondel and Patte in their treatise (Redondo 2013: 83-86). In this case, the partitioned vaults are used for multi-storey buildings, whose floors are now solved in the form of "voûte à l'imperiale" (groin vault) and covered with a timber structure for the roof. Its specific origin is unknown, although the presence of a vault of this type in the building of the former Lyon Stock Exchange, built by Jacques-Germain Soufflot between 1748 and 1750, is significant. This work appears in the compilation of *Oeuvres* (1769) by Pierre Contant d'Ivry, where we can also find a picture of the sacristy of Notre-Dame de Paris (1754-1760), designed by Soufflot too. Bearing in mind that the latter was executed with tile vaults (Braham 1980: 265), we can suspect that Contant's contribution had to do with the application of this new technique, a phenomenon that could also have occurred in Lyon. Unfortunately, the original vault of the Stock Exchange was demolished and replaced by another lower in the 19th century, so we do not know about its workmanship.

We do know in great detail however the circumstances under which the proposal of Contant d'Ivry for the church of Saint-Wasnon in Condé-sur-l'Escaut, in the north of France (1751-1756), was conceived. This seigniory belonged to Prince Emmanuel de Croÿ-Solre (1718-1784), military and aristocrat who married Angélique-Adélaïde d'Harcourt (1719-1744), daughter of François (1689-1750), Duke of Harcourt and Marshal of France, in 1741. The young wife was the favorite niece of the Marshal of Belle-Isle and, in fact, the wedding took place in the private chapel of the Hôtel de Belle-Isle, in Paris.

As a result of the ruin of the medieval church of Saint-Wasnon, in 1750 the authorities of Condé-sur-l'Escaut decided on its reconstruction, entrusting the project to a local builder. The prince, idle after having returned from the Austrian wars, decided to get involved in the matter and consult the proposal to "the most famous architect of Paris, called Contant", whom he knew with certainty through Belle-Isle. The same architect was also asked about the design of the Hainaut General Hospital in the nearby town of Valenciennes (1751-1767), designed by the provincial engineer Charles-Toussaint.

Contant rejected the original project for Saint-Wasnon because it used too much timber, which would eventually rot, proposing its resolution by means of tile vaults. The design of the building, totally innovative, derived directly from the architraved architecture of the chapel of Versailles and included the proposals by Cordemoy (1706, 1714) and Laugier (1753). The direction of the work, however, was the responsibility of the local master builder, and was supervised by Croÿ-Solre himself, who personally designed the details and the liturgical furnishings, under the supervision of Contant (Joudiou 1986).

The new fondness of this dilettante aristocrat would lead him to follow closely the investigations of the Count d'Espie, whom he presented to the Court after having "worked several times, in winter, to correct and perfect his work". He would also follow with interest the execution of the vaults of the Palais Bourbon de Paris (1768), residence of the prince of Conti (Moulin 1991).

5. Public buildings

In little more than a decade, what had begun as a constructive extravagance in the stables of a country residence had become a full revolution. And behind it all was the Marshal of Belle-Isle, to whom Espie dedicated his book with a complimentary prologue. It is difficult to verify to what extent the success of this publication might have influenced the political career of the then governor of the remote region of Trois-Évêchés, but the fact is that in 1756 he was appointed Minister of State (Royal Councillor) and in 1758 Secretary of State of War (what we would now call Minister of War), a position he will hold until 1761. In this context, it seems reasonable to consider Belle-Isle responsible for the use of tile vaults in the new Ministry of War (1759) at Versailles, designed by Jean-Baptiste

Berthier, who will repeat the experience at the Ministry of Foreign Affairs and Navy (1762). Echo of these works may be the proposal of Le Camus de Mézières for the annular vault of the roof of Halle aux Blés (1763); and the solution of Le Carpentier and Bélisard in the Palais Bourbon (1768). The latter one was the Parisian residence of the prince of Conti who, as we saw, had been the protector of Contant d'Ivry and comrade-in-arms of the Marshal of Belle-Isle. These buildings and their vaults were discussed in detail by Pierre Patte in his *Mémoires sur les objets les plus importans de l'architecture* (1769) and in his additions to Blondel's *Cours d'Architecture* (1771-1777). But they would really pass to posterity thanks to Jean-Baptiste Rondelet and his *Traité théorique et pratique de l'art de bâtir* (1802-1817) which, with its 17 editions, considering only those in French, became one of the bestsellers of the history of architecture.

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CHAPTER #7.03

HERITAGE IN BETWEEN "PATRIMONIALISATION" & SUSTAINABILITY: THE CASE OF THE MOROCCAN MEDINA

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1. Introduction

The term "heritage" used to have multiple meanings in the past, rather related to the family, economic and legal structures of a stable society. Qualified by various adjectives, it became a "nomadic" and multidisciplinary concept. It refers to "a set of goods that we have inherited from our fathers and that can be passed on to future generations" Selicato (2016). This definition indicates the importance of conservation activities as "cultural heritage" that is claimed as a common good for humanity which should be preserved for future generations as a representation and evocation of the past. This is how we grasp the strong intersection of the notion of "heritage" with that of sustainability. The conservation action is therefore necessary because the elements of the past should be considered as a common good for all generations, a good that must be used according to the needs of each era. This approach goes beyond the crystallizing aspect reflected of conservation. A conservation act aim to perpetuate cultural goods, respecting old and new values and habits.

However, in order to understand the development and the different practices that resulted from it, especially in a country that came out of conservation we need to go back its origins, especially when as to colonized countries such as Morocco. Therefore, a multitude methods (stylistic and historical restoration) to approach the heritage conservation, as a discipline, were born within a political context of France, Italy and England philosophical schools. However, the concept of heritage has expanded to new fields of interest that go beyond the physical dimension of space. Thus, any object of the past can be converted into historical testimony without having, at the beginning, a memorial destination. Through Ruskin and its conservationist approach, the notion has undergone remarkable changes, moving from the historical monument to the domestic architecture materialized by the "historic city" as an urban heritage called in other terms the "Patrimoine".

The heritage is no longer limited to remarkable buildings. As shown by the long list of "World Heritage" established by the Unesco, heritage includes now buildings and the urban fabric, such as villages, and cities. The process of "patrimonialisation" has therefore been initiated through conservation and heritage became a passive deposit of historical memory dissociated from communities, and as we will explain with an example later in this article, the monument stands in the background, constituting a simple urban landmark, a signal rather than a sign.

Heritage is undoubtedly essential to maintaining the collective memory and communities identity, but the crystallizing conservation practices represents a hindrance to its natural evolution. Therefore, a real compatibility between "mode of intervention" and "intervention framework" should be highlighted through a deep understanding of each context Upton, (2001). Furthermore, the phenomenon of patrimonialisation contributes in somehow transforming heritage to a Marketing object, sacralised as protected circus site. Due to tourism issues, heritage becomes a new way of entertainment through its "folklorization".

In order to deepen this subject, we would work on case of the medina as a historic fabric that suffered much from this common categorization among both professionals and researchers. Whatever conservation action be (preservation, re-habilitation, restoration, and renewal), a new line of thought needs to be explored to redress this big state of heritage dealer. This paper is, questioning the concept of patrimonialisation

and its impact on defining the medina itself and how its preservation was planned accordingly. It will also highlight unraveled values of the medina as a sustainable model that has potential role in synergizing the contemporary decontextualised cityscapes.

2. The French protectorate in Morocco: the foundations for a precursory legislative framework

In western countries, the recognition of a universal history involved the adoption of the "museum" and the preservation of monuments as a testimony of the past. However, the concept of heritage has known crucial changes through institutional and legislative framework, which has deeply impacted its transformation process. Indeed, Universels charters (Athens Charter for the Restoration of Historic Monuments and Venice Charter for the Conservation and Restoration of Monuments and Sites), in add to UNESCO Convention of 1972, profoundly participated in adopting a crystallizing approach and neglecting the important role of heritage as a dynamic element in evolution of cities.

Once more, the adopted approaches failed to reveal the importance of culture and social expressions in protection of "material" heritage, until the 2003 Convention, where both tangible and intangible heritages were jugged deeply interdependent. However, compared to Europe, the experience of colonial politics in terms of urbanism and heritage was at the forefront in Morocco. In terms of safeguarding, the conservation of historic monuments is based on a strong legislation which dates from the time of the French protectorate. Politic, economic and aesthetic considerations were at the origin of this crystallizing approach.

Through the legislative decree concerning the dahir of November 29, 1912 related to the conservation of historical monuments and historical inscriptions the notion of classification will appear establishing the beginnings of conservation. At that time the Medinas were not taken into account as urban heritage. Later, the Dahir of July 21, 1945 will focus on the definition of ancient cities and propose to put in place "protective regulations to preserve the appearance and character of ancient cities (...) and to maintain the unity of the architectural and decorative style of these cities "(Article 43 of the Dahir).

After independence, the government waited eighteen before creating the Ministry of Cultural Affairs in 1974, an institutional entity in charge of heritage. This delay certifies that the issue of heritage and its safeguarding was not a political priority for the kingdom and that it had not yet taken place in its collective consciousness. However, it's important to notice that no new technical or operational development in conservation practices have emerged from the colonial period. This conservative approach, dictated by a western specific vision of the past, has created a deep break between the inhabitants and their living environment, while the native approach should be more sensitive to the human element by taking the evolutionary aspect of the medina into account. By this institutionalization of the patrimonial consciousness, the principle of safeguarding was officially placed in the collective consciousness and the process of patrimonialisation was established. The patrimonialisation can then be considered as the perverse effect of conservation and preservation practices. Firstly, It took shape in Morocco when the interest in the "heritage" was instituted by the colon. Then, it appeared when the collective awareness of the importance of identity issues and belonging has begun to emerge. Behind this emergence, there are often economic reasons (intensif promotion of external tourism) and sometimes the emotional nostalgia for history, leading, in excess and by «fashionable» effect, to "patrimonial syndrome".

This syndrome is even rife in new tourist projects outside the walls of the medinas with the objective of "reconstruction of memory", an identical reconstruction which is more physical than symbolic. Moreover this trend has already been initiated, at the time, by the French settler for some security and hygiene reasons. This reproduction phenomena has first started during the colonial period through the "Habous" district, when the french colon chose

to reproduce the medina outside the walls for hygienic but also for political reasons. However, reproducing medina became nowadays a real fancy in order to attract more tourists and more investors. The idea of creating a medina in the new city of Tamesna reflect, for exemple, how it was ridiculous to think that a physical reproduction can imitate the original one with its cultural and historical particularities. That awkward return to the past was the greatest danger for heritage: the approach adopted by the settler was justified by a particular political and cultural context (protectionist view of the foreigner in full discovery of a new architectural culture to mediatize and even folklorise through conservation).

3. After independence, dependence: the decline of the medina in the face of conservation policies

The current state of the medina is the result of the perpetual conflict between two contradictory political wills inherited from colonization: one traditionalist and conservative (defended by H. Terrasse) and the other pragmatic and less nostalgic (advocated by Ecochard). What was basically a colonial strategy opposing two urban logics (based on a physical separation of the European and indigenous communities) had the effect of fossilization then the deterioration of traditional fabrics (Figures 1, 2 & 3), and the effect of radical change in the way of life of the indigenous people towards a hybrid and decontextualized model.

Figure 1. Precariousness of the buildings of the medina. Source: Photo talen but authors (2017).

Figure 2. Water infiltration after restoration actions. Source: Photo talen but authors (2017).

Figure 3. Decontextualized restauration action. Source: Photo talen but authors (2017).

The innumerable inscriptions and classifications on the national heritage list (governed by law 22-80 concerning preservation of historic monuments promulgated in 1980) or on the world heritage list, bearing the "UNESCO" label, have also participated in the trivialization of the concept of heritage from the time when everything can be considered as having heritage value if it has a historical anchor. Moreover, on the pretext that safeguarding and protection, the process of registration or classification has the ultimate goal of maintaining the heritage object in its original state. Then, once classified no change can be made without the consent of the authority in charge of culture or by UNESCO in the case of world heritage. Thus, the lack of a controlled re-allocation approach and the lack of financial means, the maintenance required for the survival of these listed buildings was not provided. This race towards classification

is strongly motivated more by economic ends than cultural ones. For example, tourist overexploitation has led to a folklorisassion that threatens the way of life and culture of the local population (the Marrakech Medina is the best example). This is how the balance between economic and cultural finality of heritage is constantly oscillating between destruction and mummifying of the local culture.

In add to this, the failed actions of conservation distorted the specificities of spaces. Aesthetics approaches ares adopted by unskilled restorers. In the case of the citys of Meknès and Fès, for exemple, the restauration or rehabilation actions was the same for different types of medinas (Figures 4 & 5) : An example of that standardization in restaurantion actions to the point of confusing between the two medinas.

Figure 4. an alley in the medina of Fès.
Source: self made Photography (2017).

Figure 5. an alley in the medina of Meknes.
Source: self made Photography (2018).

However, faced with the sterility of the action of classification of monuments especially medinas, some questions emerge: for whom do we classify? What is the purpose of these classified monuments if entire neighborhoods fall into ruin without active rehabilitation, if dozens of homes are crumbling in dilapidated conditions and if whole areas are downright denatured by meaningless restoration actions? The medina dwellers don't care to know if the medina is universally recognized or if it appears on the long "protected monuments" list. What frustrates them more is that they doesn't benefit from the action of medina classification and that there is no consideration of their precarious situation. Hence, museification produces spaces void of content and therefore without reason to exist.

However, there is an restauration example that is deemed successful. The permanent market « Souq Waqif » in Qatar is actually considered as an example of the bringing back the memory of the place through rehabilitation, renovation or reconstruction actions. Radoine (2010). As an ancient site that has a historical loading, the artist Mohamed Abdullah with the support of the Emir Emir (Cheikh Hamad bin Khalifa al Thani), tried to wait for a set of goals as following: protect the souk from the nearby urban escape (Figure 6); Maintain the activities of the souk and the distribution of its specialized areas; Create organic trails and walkways; Design a maximum of shaded areas; Restore dilapidated buildings; Rebuild lost coins; Delete random changes and additions; Update and modernize its services (Figure 7); Maintain an authentic environment; Promote the human dimension; Enrich the socio-cultural experience of users; Reactivate and activate the socio-cultural memory. As such, we stress the importance of understanding the utilitarian and functional dimension in the birth of each spontaneous urban site. Accident or Chance in spaces arising (with whole their collective lives) are unacceptable.

Figure 6. A part of the outside of Souq Waqif. Source:http://bas-tours.com/en/souq-waqif-tour-with-dinner/.

Figure 7. Restaurants and shops. Source:http://www.thetravelingginger.com/traveling-ginger-blog/layover-in-qatar.

4. Conclusion

It's obvious that the conservation of cultures and social expressions are essential for the protection of "material" heritage both in bringing them to life and ensuring their maintenance. Thus, a particular importance to local communities should be attached regarding the role that they play in the protection and enrichment of heritage and because of the deep interdependence between population, activities, and places.

Moreover, in morrocan context, the building/human relationship goes beyond the simple function of memory: the "Maalama" coming from the Arabic verb "Allama" (to learn, to teach), has an intellectual meaning referring to the collective unconscious by a pedagogy, a teaching, and a practice dedicated to last in time. Based on "Al Qasd" which is a functional end of town planning, and on the recommendation of sobriety "Al Bassata", our authentic cities, with such values, can not be reduced to the simple function of memory, immutable and superfluous as World Heritage entities are subject. Bouayad (2007).

Medinas should be explored as an empirical experiment to guide sustainable urbanization in contemporary Moroccan cities. By revisiting this traditional and innovative model, a successful approach to local development planning can be adopted to reposition the medina in the current urban fabric.

A pioneer in the field of sustainable development, the medina has always represented a strong ecosystem between nature and urbanization and an astonishing capacity for morphological and typological architectural adaptation. It has a great capacity for saving energy by limiting polluting mobility and building density, a participatory process of urban spaces based on systems of solidarity and the practice of equality between people and a symbolic spatial representation. Medina must be reactivated and reinterpreted, against a "generic" urban model carried by modernized globalized ultra-liberalism, which engenders the destruction of the environment, the social bond and cultural diversity. Gossé (2011).

Beyond the aesthetic considerations, the territorial decision-makers should use the unraveled values of the medina as a sustainable model that has potential role in synergizing the contemporary decontextualised cityscapes and as a lever of the local development. Unlike the patrimonialization concept, the main objective of an active rehabilitation is more to integrate the heritage in the heart of the city than to celebrate the vestiges of the past as a static relics.

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CHAPTER #7.04

LA GRANJA DE SINYENT: A MEDIEVAL ARCHITECTURE SURROUNDED BY ENIGMAS

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1. Introduction

Sinyent was one of the few Cistercian farms of the Kingdom of Valencia, since the monastic order arrived there in the thirteenth century with its basic principles called into question. In the Valencian Region, there were two Cistercian monasteries, Santa Maria de Valldigna and Santa Maria de Benifassà, they built a small number of farms, from which we can say that Sinyent is the only one of the 14th century conserved despite the many transformations and reforms that have blurred its Gothic character. (Guinot, 2001, 1252).

The lack of information and documentation of the everyday reality of people that lived in La Granja is not surprising, because, as we know, culture and history have been written by nobles and ecclesiastics and not by Conversos monks (many of them didn't know Latin), much less by laborers or servants. Hence the importance of finding out and contributing to the history of this architectural ensemble through the analysis of all the documentation that surrounds it, as well as its social and economic context. The study of the income evolution of Sinyent and the strength or instability of the Valldigna'sMonestery is therefore indispensable to uncover the functioning of the system, the good or bad health of its facilities and the desire to reform the building.

This research goes into the historical entanglement with the aim of providing clarity and order. The variety of theories that surround the building and the various versions given by experts have attracted the attention of certain academics and lovers of the historical heritage, which helps to value the monument but ithasn't resolved a question that is discerned twisted.

2. Historical Study

Sinyent was a little Islamic *alqueria* wich probably disappeared at the end of the 16th century. The causes of itsdepopulation are unknown but we risk to propose some hypotheses.First of all, in view of its location, just 150 meters from the edge of the Xúquerriver, it's easy to consider the possibility that the site of Sinyentsuffered a flood that would end up with its constructions. In the Ribera area, the Xúquerriver has characteristics that make it conducive to endemic flooding, due to traits that have persisted immutable in the last ten centuries. Madoz(1846) describes Albalat de Pardines, located on the other side of the river as: "so deep that it's always exposed to the fury of the avenues, having already seen their homes with 3 water rods, and their habitants about to perish."(vol.I, 289).

In the historical documentation Sinyent appears with the name *Signen, alcheria de Corbera,* (Ferrando, 1979, 168), on the one hand, it suggests that in 1238 Sinyent wasn't only a building or a *alqueria*, but several constructions that housed a various families and formed a population nucleus of small dimensions. Moreover, for isolated homes, the term *casona* or *casa* is usually used, and in most cases, their donation in the Repartimentwas made together with some hectares of land. It's important to understand Sinyent in its globality; in that historical moment, the people who lived in the area were Arabs who didn't leave their homes and Christians who arrived there (Guinot, 1998, 79-108). In this context we find the existence of a building known as La Granja de Sinyent, but in order to look for the typological model, we should try to resolved two questions:How did the Cistercian farms of the fourteenth century were? And, what kind of provisions they had?

The Císter is a monastic order founded in 1098 that arrives in Valencian lands almost two

hundred years later. It helda position that arise as a critique of the high level of wealth that the order of Cluny had achieved. In favor of its contestatory ideology Cistercian farms were created asconstructions for the production of agricultural and livestock products that served to supply the monastery and to sustain the economy of the ecclesiastical institution. Its facilities were managed by a *llec* brother, charged of work in place, (Sanchez, 2001). Jaume II promoted the creation of the Cistercian Monastery of Santa Maria de Valldigna in 1298, placing it in a key place for controlling its new kingdom. This wayValldigna began a territorial expansion, in 1328, the Monastery acquired the land of Sinyentto useas a farm, (ArxiudelRegne de València, file 795, box 2.073-74 and file 818, box 2137-38).

3. The Architectural Ensemble

La Granja de Sinyent is an architectural ensemble of several volumes distributed around a indoor patio creating an irregular quadrangle geometry with an unknown functionality. Some experts argue that it was a public building with defensive elements and where some type of religious office was also carried out (Matoses, 2012).

Regarding the morphological description,the complex is composed by *body* 1, the most relevant one to be the oldest of the four volums, which is knownas La Casa de Sinyent or La Granja. It's located with the main façade parallel to the current CV-505 road and the back sidelooks towards a patio. It has a floor size of 20.27 x 8.70 meters with its ground floor raised about 50 cm above the ground level.It's made up of two parallel naves that split the space longitudinally into two spans. The ground floor is enclosed by twelve three-pointed ogival arches and inside there are three large alternate arches arranged in the transverse direction dividing each of the two spans into three rooms. On the first floor, the two spaces are separated by a longitudinal wall and its most significant elements are a pair of festejadors, medieval pictorical remains and a window made with two ogival arches and a central colonnette made of stone. The rest of the adjacent volumes are later additions, the western one was built in the Eighteenth century for the breeding of silkworms (unfortunately, they are no wood scaffolding left).

Situated perpendicularly and in the north direction to the previous constructions we find the most recent volume, dated from 1801 that served as stable and loading bay for cats.

Figure 1: Exterior image of La Granja de Sinyent. Ownsource (2018).

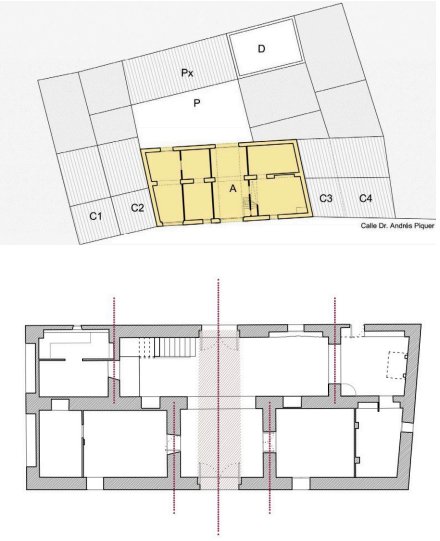
3.1. Typological analysis

The research is focuses on the main building, previously called *body 1*, for being the most important historical and architectural one. Accordint to its configuration, its ground flooris divided longitudinally into two rectangular spans generating two naves that are tripartite in the transverse direction. All the previous partitions are structural with the use of ogivalarches of 66 cm of thickness.

The creation of two naves is a mechanism that we can easily find in the valencian *alqueria* allowing the division of space to associate different uses, one more linked to work (rural and domestic work) and another one as living room, it's also a way to build larger houses with smaller spans. There are many examples that illustrate this scheme, such as the 18th century Alqueria de Brosquill, the Alqueria del Rellotge of the 17th century, or the Puchades Alqueria of the 15th century, the three have been declared BRL. In these cases the cross walls are distributed parallel to the façade and the central one takes a greater height to be the point of support of the gable roof. The back line defines the façade of minor importance that looks towards a patio while the main facade is the one that welcomes the newly arrived.

Within this popular typology we find other two characteristics that are associated to La Granja: the predominant central axis that crosses the entire volume connecting front and rear facades, and the internal space distribution.

Indoors the space is divided by ogival arches in a first arrival room that leaves to right and left two rooms with its doors faced symmetrically. The first entry space is "decompressed" when we cross it toward the second span. It's a very typical sequence in most domestic rural architecture of Valencia: to arrive, to cross and to stay. In rural tradition, the second span may be completely diaphanous with only two fixed elements: a staircase to the upperfloor and the fireplace. An organizational model that works very well in the peninsular East to serve Mediterranean traditions where much of the domestic activity is developed outside the home and where the meeting space is fundamental.



Figures 2-3. Floor Plan of the alqueria del Rellotge. Del Rey (2002) and the ground floor of La Granja de Sinyent with the marked central axis and it structural composition. Own source (2018).

Valencian rural architecture has been extensively studied by Miguel Del Rey (2002) who has documented, analyzed and classified it. In his studies he dated the emergence of this double-span typology in the 16th century, affirming that until then a more primitive configuration with a single-spanbasilicalscheme was used. However, the author rectifiedlater placing the systemat the end of the 15th century when he finded previous evidences, (Del Rey, 2010, 253).

La Granja would break this paradigm, as it was built 100 years earlier, at the beginning of the 14th century (Soler, 2002iClarí, 2016). This issue suggests that La Granja followed another model that doesn't come from farms of its time, but it might be based on some other type of contemporary reference. It's necessary to take into account the context in which its construction would began, in the middle of the adaptation of the kingdom after being conquered and with a society, and a popular knowledge, still arabized.

The composition of the floor planposes another challenge, the passage from the North to the South navetakes place through a large central

arch that have two medieval doors on its sides that give access to the lateral rooms, now walled and turned into larders. The characteristic ogival arch is remarkable, pattern of the Gothic style, and its width allows the passage of a person. As a comparison, other examples of this medieval door are in the Castle of Cullera or, indeed, on the first floor of La Granja communicating the north space with the southern room. Although the type of door is very common in the Early Middle Ages, its peculiarfloor position is striking and, as mentioned above, suggests that the origins of La Granja should be rethought.

Detecting a tripartite arrangement, in a building such as La Granja, is not trivial due to its unclear functionality, it's a resource that we have nowadays located in certain Arabian palaces of Hispanic-Muslim architecture. There are numerous examples of the nobiliary architecture of al-Andalusthat include two symmetrical passages towards the main room. Examples are the Aljaferia of Zaragoza, or the Alcazaba of Almeria, both of the 11th century. However, in La Granja, the room is narrower, forming something similar to an *iwan* of T-inverted Tunisian houses, where the side doors have a functional justification for being an access to different rooms.

3.2. The metric study

Initially, it seems reasonable to think that the building, built in the 14th century, had to be projected and constructed according to the dimensions of that period. *Alna* (0.906m), *Foot* (0.302m) and *Valencian Handspans* (0.222m) were the most commonly measurement units used at that time, thatwere relatively standardized. If we try to apply this metric to La Granja, we get some unusual results. The floor plan (8.76 x 20.26m) would measure 9 *alnes* and 2 *feet* x 22 *alnesplus* 1 *foot*.

First of all, the use of *alnes* and *feet* instead of *alnes* and *handspans* (wich were the most common units) is strange, but with *handspans* the dimensions aren't coherent; we would have a floor plan of 89.5 x 38.8 *handspans* when the most usual is to fit the length to obtain exact numbers and this way simplify the composition, such as 90 x 40 *handspans*. It is therefore illogical to project a building without using clear proportions easy to execute, wich discards the use of Christian measures. Although everything seems to indicate that the building was built in the 14th century, a 58 cm project modulehas been identified, it allows us to get a dimensions of 15 x 35. This module could correspond with the *Rassassi Cubit*, also known as *Ribera Cubit*. It ranged between 30 and 36 *fingers*, from 52.24 to 62.28 cm, and it was different from the *Mamuni Cubit*, which ranged between 24 and 27 fingers (Romero, 2004, 64-67). Hernández Giménez (1962) identified a very similar module of 58.93 cm in the Córdoba Mosque.

Although the floor plan doesn't follow the proportions of the Golden Rectangle, its perimeter shape is spatially harmonious, which suggests that it isn't a randomly drawn silhouette but rather a studied composition. Looking for proportions of its outer rectangle we haveobtain a ratio of 3:7, afraction easy to find in Andalusian architecture.

3.3. The stratigraphic analysis or "face reading"

In order to draw more concrete conclusions at a constructive level, the stratigraphic analysis is carried out with the five main facades, and although the results are not absolute, they serve to periodize the stages of the building within its chaos.

On the one hand, the southern elevation reveal certain constructive unitybetween the ground floor perforated by five pointed arches made of brick and the first floormade oframmed earth. We also observe three ogivalgothic windows, the central one preserve a stone mullion, whereas the side windows have neither the decorative molding at the beginning of the arches, nor evidence signs of its existence.

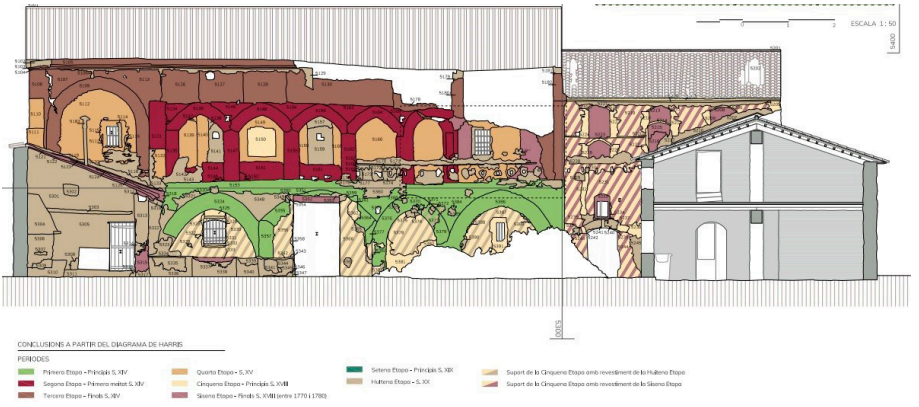


Figure 4. Stratigraphic periodization from the Harris diagram of the north facade. Own source (2018).

However, on the north elevation the contemporaneity of the ground floorarchety and the first floor construction seems to be obvious. There isn't a structural joint between the two levels and the dimensions and the bond of their arches is very similar. In this way, the five arches of the upper gallery fits in the dimensions of the three central arches on the ground floor, leaving on its western side a sixth arc of larger dimensions. The westernmost arch of the gallery seems to have been projected as a door of an exterior staircase, (Iborra, 2017, 179). The stratigraphy analysis evidence thatit was subsequent and its upper brick wall, made for the forces stabilization,is contemporary to it and was interlock with rammed earth as a screed of the gallery. We could assume that this last intervention served to match the height of the two main facades, integrating the gallery executed previously. On the east side of the facade a series of repairs in brick and ramed earthare mixed,because of this it's very difficult to periodize this segment of wall, but it's later than the elements described above.The ground floor arches were walledat an uncertain moment, with the exception of the two central ones used as entrance. The analysis of the brick bonds of the blinded perimeter arches could point to a transformation carried out when the adjacent volume was built, in the eigthteen century.

4. Conclusions

Thanks to the stratigraphic analysis, it has been possible to answer several of the unsolved questions posed by the property. The closure of the perimeter arches of the ground floor in the eighteenth century coincided with the arrival of silk and would mean that the groundfloor remained open for more than three hundred years. On the other hand, the periodization of the great western arch of the northgallery has allowed us to relate it to the existence of a Cistercian oratory, as well as to establish an evolutionary hypothesis of this semi-demolished façade.

The typological study and the metric research carried out seem to indicate that the main building follows a project model prior to the twelfth century of Islamic origin.

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CHAPTER #7.05

ROYAL GARRISON CHURCH. CONSTRUCTIVE AND STRUCTURAL ANALYSIS

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1. Introduction

Spread throughout the south coast of England it can find this kind of ecclesiastical buildings that in their antiquity functioned as hospitals; cities such as Southampton, Dover, Arundel, etc., accessible by boat, with important ports which allowed the pilgrims easy access to these places without having to travel to other cities further inland. All these constructions date from dates close to the 12th, 13th and 14th centuries.
Many features of the late Norman era are seen in the Royal Garrison church, although it was already built at the beginning of the Medieval Age, also adopting the architectural features of the first English Gothic (Figure 1).

Structural analysis of the Royal Garrison church will be made by means of the EF non-linear regime ANGLE software (Alonso, 2014) and the behaviour of the materials will be measured by the so-called "damage model" (Oñate et al., 1996). The results will provide an excellent knowledge of the structural behaviour of the First English Gothic.

2. Royal Garrison Church

The Royal Garrison Church, also known as "Domus Dei", was built in 1212, a time of transition between the Norman style and the appearance of the first English Gothic, a time when England was covered with large and small

Figure 1. Current status of the Royal Garrison church. Author: Vera, Ester (2016).

churches, especially between the years 1150 and 1250.
The construction was founded as a hospital in which the sick and pilgrims who came to the area were treated. These hospitals in England were generally built in the ports of the cities or near the sea, so the original constitution of these churches was not purely ecclesiastical (Wright, 2012).

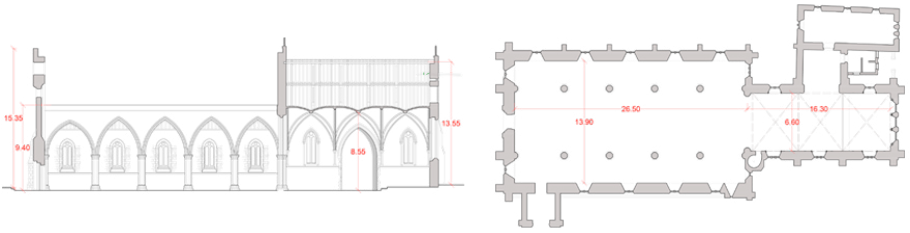

Figure 2. Cross section and Plan of the current state of the church. Author: Vera, Ester (2017).

Around 1547 the church went from being a place of worship to an arsenal of military ammunition, this was one of the facts that would unleash the dilapidated state of the building in its following years. After this period of use as a warehouse, construction came military hands and the church was part of the set of buildings that formed the governor's house (Hubbuck, 1976).
In 1826 the governor's house was demolished, and with it all the surrounding buildings, except the church, which remained almost abandoned.
Before the almost ruined state of the construction, in 1866, the architect G.E. Street carried out a great restoration in Victorian style on the building. This restoration lasted until 1868. It was tried to return to grant the medieval style to the construction, for it the original length of the central nave was recovered constructing a vain more towards the West, and in addition the octagonal tower bell and the porch were added on the South elevation.
In 1933, the importance of this building as the heritage of the city was recognized and it was included in the catalog of relevant historic buildings. Data obtained through the publication in the newspaper The Big Question Mark over Portsmouth (1958).

3. Numerical Analysis

Through the structural analysis it is possible to analyse and compare the behaviour of the First English Gothic primary structure of the Church under the action of the wind and the passage of time, increased this situation by situation so close to the sea.
The finite element analysis is performed by means of the ANGLE software, from the current geometry and based on its constructive configuration the calculation models are generated with CAD tools. The method used to simulate the behaviour of the stone and brick is the "damage model", one of the most rigorous methods to reproduce the response of fragile materials.

3.1. Mechanical properties of materials

A sensitive issue in all studies on the behaviour of historical structures is the characterization of the mechanical properties of materials (Ramos and León, 2013).
The properties of the materials (Table 1) has been made from the data obtained by Archaeologists specialized in the classification of building materials, belonging to the University of Portsmouth, provided great information about the characteristics of the materials used, as well as their origin.

Material	D (t/m3)	E (N/mm2)	Poisson
Ashlar	2.3	19000	0.2
Masonry	2.1	9000	0.2
Wood	0.5	12000	0.15
Vault filler	1.5	1000	0.1

Table 1. Mechanical properties of materials.

3.2. Constructive model: the damage model

Damage mechanics introduces changes to the material at a microstructural level through internal variables. These variables modify the influence of the material behaviour history in stresses evolution. The fissures appearance and their evolution over time are described as the damaged points trajectories.
Cracking is represented as an effect of local damage, which can be characterized in terms of compressive and tensile strength of the material from the known material parameters and the functions that control the evolution of cracking under a successive state of the strains at each one of the points.
The structural analysis was performed using the finite element non-linear regime ANGLE software, taking into account the application of the isotropic damage model developed by (Oller, 2001).
S is the total surface and S' the effective resistant area, so S-S' is the surface of holes that the material has suffered, being defined the variable of damage d as:

$$d = (S-S')/S \qquad (1)$$

The index d (1) indicates the degree of deterioration of the material ($0 \le d \le 1$), the zero value being the undamaged state and one the total deterioration of the area of the material. The relationship between the Cauchy tension and the effective tension acting on part of the effective resistive section, calculated by the equilibrium condition (2).

$$N = S\sigma$$
$$N = S'\sigma'$$
$$\sigma S = \sigma' S'$$
$$\sigma = (1-d)\sigma' = (1-d)E\varepsilon \qquad (2)$$

This scalar index is sufficient to adequately represent the behaviour of materials such as concrete, brick and stone (Figure 3).

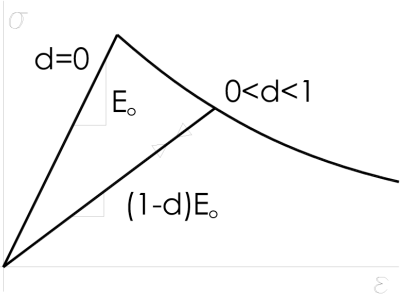

Figure 3. The effect on the mechanical behaviour of the material is a reduction of rigidity proportional to (1-d).

Where D is the elastic matrix for an isotropic material, constitutive matrix D´ is calculated as (3)

$$D=(1-d)D \qquad (3)$$

Therefore, the damage index is (4)

$$d = G(r_n) = 1 - \frac{r_0}{r} \cdot \exp\left\{A\left(1 - \frac{r_n}{r_0}\right)\right\} \qquad (4)$$

Where r max {r0,rn} and A parameter that depends on the energy dissipated per unit volume for a process of uniaxial tension process.

3.3. Structural Model

The model has been generated from the original structure, excluding the constructive parts of more recent period, such as the sacristy, the tower and the porch (added by the architect GE Street in the restoration of the 19th century).
Two calculation models have been considered taking into account the different construction elements, that is, the first model that corresponds to the state of construction prior to the nineteenth century reform, and the second model to the which has been incorporated a roof in the central nave.

4. Analysis Results

In general, the results obtained indicate, for gravitational loads, the maximum stresses (Sz) occur at the base of the central columns and reach maximum values of 1 N / mm2 far below the compressive strength considered in the calculation. The damage index is concentrated in the joints of the walls of lateral corridors with gabled walls. (Figure 4).

From the application of the wind in the two possible directions, stress values are extracted and deformed for the upper part of the walls where this load affects; the doubt prior to the analysis was to know the behavior of the West elevation before these loads due to the current situation in which it is located, without a roof that braces it longitudinally.

4.1. Original structure model with lightened roof over the central nave

The proposal of a new roof as a response to the rehabilitation and conservation of the historic building, is proposed with the design of a roof executed with wooden beams of variable edge, braced by rafters of the same material (Figure 5); this new element reproduces the original volume of the original one destroyed in 1941.

The damage model of the combined actions highlights some specific areas on the supports, to which it should be added that the model has been recreated by placing point loads on the relevant nodes, but for the implementation and construction of this proposal, it would be necessary to execute a crowning band to distribute the loads on the interior walls, not

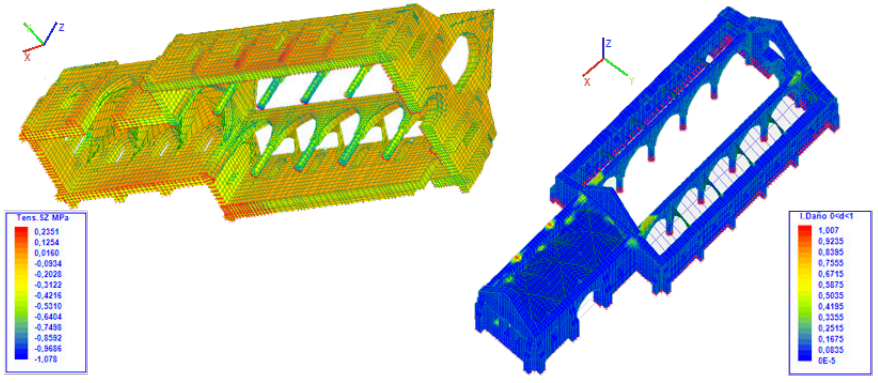

Figure 4. a) Stresses isovalues. Tensions produced by the gravitational load; b) Gravity and wind load on North elevation damage index.

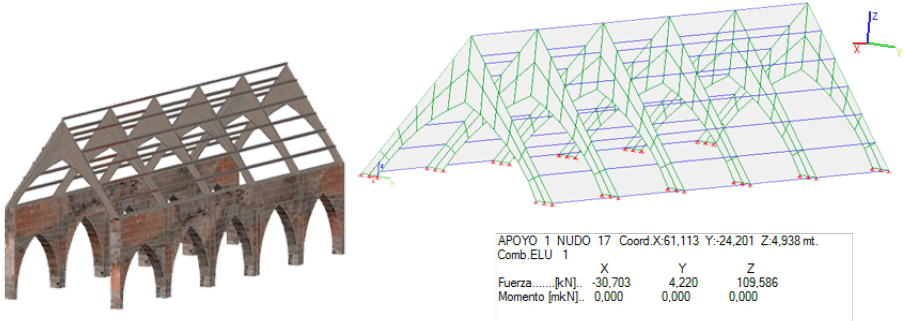

Figure 5. a) Design proposal for a new roof made with glued laminated wood; b) Tension analysis in the new roof supports.

creating singular support points and thus distributing more effectively the stresses throughout the support surface, in addition to placing a material with a higher tensile strength than the stone (Figure 6).

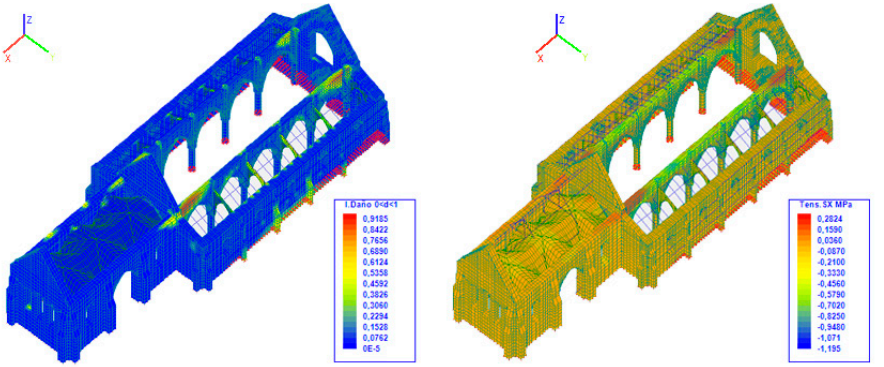

Figure 6. a) Model 2_Gravity load damage index; b) Tension diagram in X (Sx 1.117 MPa).

5. Conclusions

The first point to be highlighted in this analysis is the robustness of the structure and the minimum value of stresses and deformed analyzed. The conclusions are clear, the incidence of loads on the elevations cause deformations in the highest parts but insignificant values, which could never lead to the collapse of the structure.

To the conclusions provided by the analysis on the current state and the verification of the rigidity of the structure, it should be added that the incorporation of the new roof would neither affect the original structure nor originate on it any structural failure that would cause the collapse of the structure. It would be necessary to maintain and check the critical points indicated in the damage models as an area of possible pathology.

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CHAPTER #7.06

DIAPPERARED HERITAGE. THE MONASTERY OF LA MURTA

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1. Disappeared architectonic heritage

A large part of architectural and heritage assets has disappeared totally or partially despite the efforts that have been made to achieve the conservation, and it is difficult to prevent it from happening again. Natural disasters, wars or simply abandonment are still circumstances that can lead to the disappearance of assets even if they are in good condition and have the maximum level of protection. The case of the Palmira ruins or the Bamiyan Buddhas brings us back to a situation of intentional barbarism that we thought was from another era. The Basilica of Saint Francis of Assisi or The Glasgow School of Arts are recent cases of unintentional disappearances and in which, fortunately, a reliable reconstruction has done or can be proposed based on exhaustive prior documentation of the building.

Cases like the previous ones show the convenience of making a multidisciplinary data collection as wide as possible while the building exists. However, in many cases, its disappearance has occurred before the awareness of the importance of the asset, so the existing documentation is scarce.

In these cases, the formal reconstruction of the building is limited to conjectures based on documentary, historical or comparative studies with similar ones. The reliability of the proposal depends, to a large extent, on the volume of information that can be obtained and the remaining ruins.

The work that is presented takes as a model the ruins of the Hieronymite monastery of Santa María de la Murta, in Alzira. Abandoned at the beginning of the 19th century, currently only some of the walls of the church and the Palomas Tower remain. However, to the intrinsic value that it had, we must add its importance as a significant element within the collective cultural identity.

Based on a previous study, a virtual, formal and architectonic reconstruction has been developed, on which different types of analysis have been applied. The investigation is embedded in a process of valorization of the remains. At the beginning of the works, the vegetation and rubble covered the ruins of what was the monastery. Archaeological excavations, the research process, and virtual reconstructions have made it aprehensible as a reality.

2. The monastery of Santa María de la Murta

The Hieronymite Order (OSH) was one of the religious orders with greater influence in the Iberian Peninsula. In the case of the Spanish Hieronymites, their special connection with the Spanish monarchy, initially with the Crown of Castile, and with continuity with the house of the Austria, will be reflected in a mutual influence, which in relation to architecture will have its culmination in the construction of the monastery of San Lorenzo de El Escorial.

The order, supported by the monarchy and the aristocracy, came to possess an important built heritage, which became private or property of the state as a result of the Ecclesiastical Disentitlement processes of the 19th century. The conservation of this architectural heritage was variable. Some of the monasteries are still in good condition (such as the monastery of San Jerónimo de Cotalba). However, many of them have suffered abandonment and ruin processes that have led to the almost complete disappearance of the property.

The Monastery of Santa María de la Murta was one of the Hieronymite monasteries of the founding stage of the Order within the Crown of Aragon. Located on a previous hermit

settlement, it was founded as a monastery when the hermits who occupied the valley decided to enter the order. The building is typologically linked to the monastery of Cotalba, from which the order is extended by the Crown of Aragon.

Figure 1. Interior of the church currently.

3. The previous study

The scarcity of data on the building, both physical and documentary, requires an in-depth study from multiple disciplines, to guarantee the reliability of the proposal. The study was made from the physical remains with a dimensional and constructive analysis (walls, facings, construction systems, etc.), completing it with the historical documentation and comparing it with similar models that are still preserved.
In the case of the Murta, the original planimetric documentation of the building is non-existent. The only graphic documentation prior to the collapse of the building is a series of ambient watercolors dated before the exclaustration and signed by Máximo Peris and Ignacio Fargas. The first photographs already show the building in an advanced state of ruin.
The written texts, especially the book by Father Morera (1773) collects capitular acts, help to locate the most important pieces of the monastery and discover the relationship between them.

3.1. The typological study. Comparison of models

The Hieronymites, unlike other orders such as Carthusians or Cisterns, do not have a monastery type scheme. The fundamental pieces of all monastic architecture (church, refectory, cloister, etc.) appear, and with characteristics of the life system of the monks of the order. However, the relationship between the pieces, the location on the ground, or the general geometry of the building is variable in each monastery (Arciniega García, 2001, pg 7-8, TII).
Ruiz (1997) and López-Yarto et al.(1995) describe the common characteristics of the buildings of the order, and Sender (2014) does it on the monasteries of the Crown of Aragon specificity, from the common link with the house of Cotalba.
On the floor of the building, fixed with the excavations, the investigation has served to determine the dimensions of partially excavated rooms, and confirm the existence of missing elements, that were intuited in the remains.

3.2. The building

Given the difficulty of the model, in which architecture and topography are confused, planimetric surveys have been carried out in which both manual and photogrammetric techniques have been used. The second ones guarantee the accuracy of the data. However, the survey using manual techniques allows focusing on elements that are difficult to perceive in laser scanning, but of great importance when proposing restitution, such as traces on walls.

4. The virtual model

The reconstructive hypothesis presented in Sender (2014) has been carried out responding to the same constructive and architectural criteria as the real architecture in a coherent way with data and primary, constructive and structural studies, and those derived from the study of proportions, metrics and composition. The reconstructive process, begun in two-dimensional planimetry, has been transferred to a three-dimensional model.

Like a large extent of the historic architecture, the building is the result of a complex evolutionary process and dilated in time, in which new elements have appeared and others have been replaced. The virtual model reflects the image that the monastery must have had in the 18th century, when the morphology of the building is fixed.

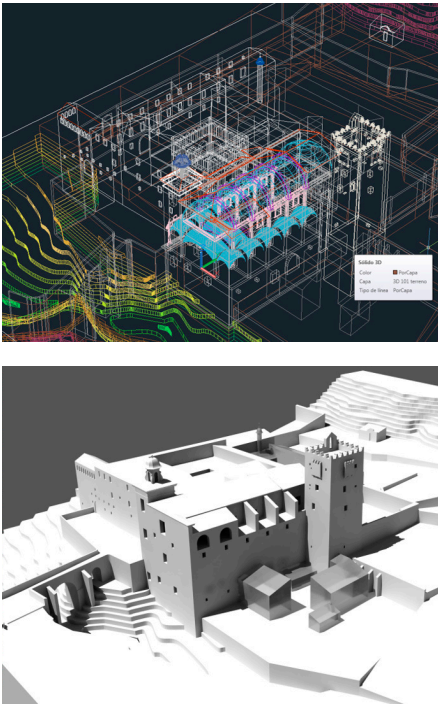

Figure 2. Virtual restitution.

5. The investigations from the virtual geometric model

Different investigations have been carried out based on virtual restitution that have ratified the validity of the model and have served to determine the behavior of the building, especially the church, in the structural and acoustic aspects

5.1. The structural study

In the case of vaulted structures, the shape is determinant in the structural behavior. From the graphic documentation and the traces that existed in the walls, it could be raised at least two possible restitutive hypotheses of the coverage system of the main nave: the succession of sail vaults and the barrel vault with lunettes. Both are constructive systems that overlap in time at the same precise moment in which the church is executed, and yet the structural behavior on the walls and buttresses is not the same.

> La elección del tipo de cierre en la iglesia de la Murta se produjo en un momento de inflexión entre el predominio de éstas y las bóvedas de cañón con lunetos. Se trata, pues, prácticamente de su canto de cisne. (p.280).[1]

In the church of La Murta, the reconstructive hypothesis allowed us to compare the structural behavior of the possible geometric solutions of the vaults that could be used on the roof of the nave of the church

The structural analysis (Perelló, 2015), carried out by FEM with nonlinear geometric and mechanical analysis, allows us to discard some of the possible systems, emphasizes the deficient behavior of others, and demonstrates the excellent behavior of the system of vaults and its compatibility with the rest of constructive elements, both walls and abutments.

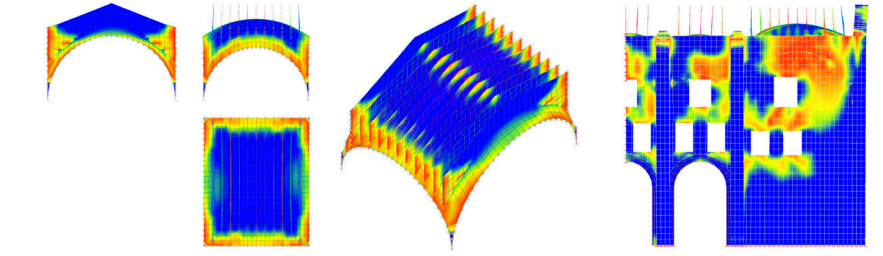

Figure 3. Structural study. Damage model of the sail vaults.

[1]" The choice of the type of closure in the church of La Murta occurred at a time of inflection between the predominance of these and the barrel vaults with lunettes. It is, then, practically of its swan song."

5.2. Acoustic reconstruction

The Hieronymite monks were known for the grandeur of the liturgy celebration, where the musical part, both choral and instrumental and organ accompaniment, had a great importance. In Sender et al. (2017) the behavior of the room is analyzed, both in front of the spoken word and the music. For the word, the reading of Psalm 29 was used as a text, from which appears an inscription on the church's façade. For the study corresponding to the music, was used the Pange Lingua, an organ piece composed by Fray José Pereandreu, a choirmaster of the monastery halfway through the s. XVII.

The auralizations have been made taking into account the positions of sound emission, officiant, organ music and singing of the monks, and the possible locations of the listener in the temple during the liturgy. For this purpose, the description of the functional zoning of the prototypical church described by Ruiz (1997) has been used, in which the positions of officiant, monks, illustrious visitors and laymen are clearly established during the celebration of the offices.

6. Results dissemination

The dissemination of the results of the research has been carried out at different levels. On one hand, by means of publication in specialized journals, (JOBS, EGA..), the dissemination of knowledge among scientific community is expected. On the other hand, it has been looked for an accessible format to the rest of the public, not necessarily specialized, which emphasizes the link between the historic heritage researched and the society, and therefore results in increasing both its positive assessment and awareness of the need to protect the asset. To this end, the video format, which is widely accepted and easy to access, has been used in this case.

The virtual geometrical reconstruction is based on the planimetry that defines precisely the reconstructive hypothesis. Through the video format, the route across the interior of the church has been simulated, merging images of the virtual reconstruction with images of the current situation, so that the location of the pieces on the remains is easily recognizable.

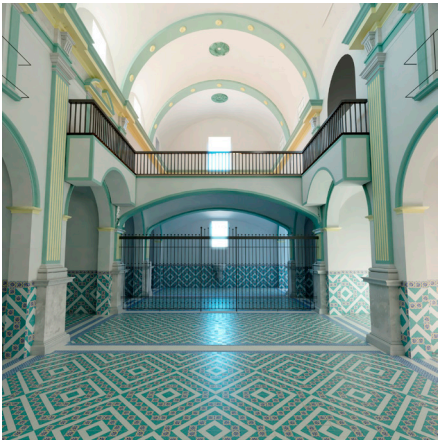

Figure 4. Virtual reconstruction of the interior of the church. Video frame.

An important team of researchers and specialists in the field of heritage has participated in the elaboration of the video, as in the virtual reconstruction, from the modeling, texturing and rendering work of the model, to the work required to complete the exterior image with a drone flight owned by the UPV Heritage restoration institute. In the same way, the video has been worked on with intense editing work, for the assembly of sequences of plans and adjustments of image, color, exposure, effects, transitions, ...

For the audio, the composition "El Monasterio de la Murta" was used. Created by the composer Javier Quilis, native to Alzira, inspired by the ruins of the monastery, who wanted to collaborate on the project. Music and image complement each other to emphasize the sensations that are transmitted along the way.

The intention of the team is to continue the work with an extension of the tour through other areas of the monastery and its surroundings, and it brings generation of a virtual reality, augmented or mixed, that together with the auralizations made, allow a completely immersive experience that unites the vision of the current reality with the experience of the building in its moment of greatest splendor.

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CHAPTER #7.07

HISTORICAL AND CONSTRUCTIVE ANALYSIS OF "LOS SANTOS JUANES" CHURCH IN VALENCIA

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1. Introduction

Valencia has been, from its origins, a city with an important strategic situation. Its position near the sea and the river Turia, has made it the object of numerous settlements since its founding in the year 711.

One of the settlements that has had the greatest impact to date in the city of Valencia was the Muslim presence. The indelible mark of the Islamic culture in our environment has brought many benefits. Among them, the construction of a wall for defensive purposes, which drew an urban plan that unites the historical past with the current urban.

At that time, the city developed part of its life around the Islamic wall. Like the other fortified cities, the prosperity in them brought with it the incessant arrival of new inhabitants. As a result, a series of neighborhoods were built, "los arrabales", which took advantage of their beneficial position for buying and selling in the city, dedicating themselves to agriculture and commerce.

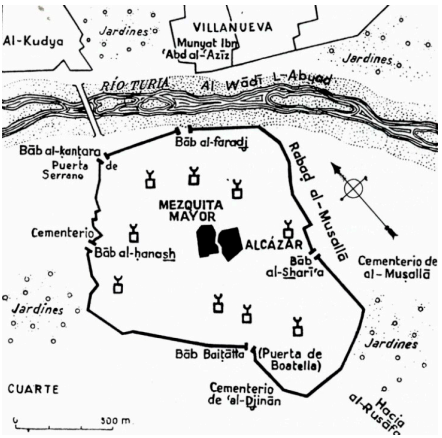


Figure 1. Schematic map of the city of Valencia in the Arab period. Source: Galarza (1990).

The continuous transit of people, as well as the nomadic character of the Arabs, made these neighborhoods of outer walls become true towns annexed to the cities. The Islamic cemeteries were also located outside the city walls, close to the city gates. His situation was not random or capricious. The special familiar treatment of the Mohammedan culture to their dead people, placed them generally next to the main communication routes, being integrated in the day to day of the people. These spaces dedicated to the dead have had notable influences on the urban evolution of cities.

In the case of Santos Juanes, located in the "arrabal" of Boatella, it happened in a similar way. Consequently, one of the key elements to be able to locate the mosque of this is the cemetery that existed at that time(LLibre del Repartiment 1978:83).

October 9th, 1238 Jaume I conquered the city of Valencia. The conquest of a new territory involves the distribution of the new lands acquired to those who had participated in the conflict. The donation of the new properties and lands won is reflected in the " Llibre del Repartiment ".

With the new change a new way of managing the city arises. It is grouped into parishes, which currently would be the neighborhoods, each having its own territory and cemetery. However the grouping of the new city is not random, it takes advantage of the layout of the old mosques converted to Christianity. As a result, the city is organized into 13 parishes: El Salvador, San Esteve, Santo Tomás, San Andrés, San Martín, Santa Catalina, San Nicolás, San Lorenzo and San Pedro. To these churches we must add those that were outside the walls that were: Santos Juanes, Santa Cruz de Roteros and San Miguel (Historias de Valencia).

In short, a set of churches that were built under similar initial premises and have clear references of the layout of the city we know today.

2. Churches of the Reconquest

Building the churches on the most important mosques in the city was a common tradition in the times of the reconquest and its later years. It involved a way to reuse existing buildings and, in turn, served as a humiliation on the reconquered inhabitants tahn any battle.

The initial configuration of the church of Santos Juanes went through a similar process. There is a parchment in the archives of the cathedral that relates the donation of the mosque to the location of the new church (Teixidor 1895).

However, Gil Gay in the book Prontuario Manual de Diferentes Asuntos on page 36, handles the possibility that the first construction was located in the cemetery. Specifically in what we now know as the Plaza de la Cementerio de San Juan, next door of the current church.

These documents also justify the orientation of the parish of San Joan. It is no coincidence that most of the churches are facing east, in the direction of Mecca, despite the complexity of the urban plot inherited from the Muslim city (Galarza Tortajada 1990).

In the middle of the XIV century the city suffers different events that will significantly mark the evolution of the city and the temple.This urban development along with the location of the cemetery, mark one of the premises that determine the position of the original plant of the parish of Santos Juanes. Delimited its physical position in the urban plot, the information collected shows a first hypothesis of the primitive plant.

Galarza reveals that the plant would consist of five modules and a straight apse without front cover. An adopted solution composed of a single nave, typical of the churches of the time.

The lateral access, typical of the Valencian churches, has as counterpart the imposition of its symmetry with respect to the axis of the church. Many of them today keep him giving access to the temple. In the case of San Joan de la Boatella, the accesses would be located on the facade of the Calle del Peso de la Paja and on the Plaza de la Comunión de San Juan.

These facts coincide with the entrance of a new artistic current that will have special relevance in the construction of the temple, the Gothic one. The technical and formal developments of the moment born in the French north reach the Mediterranean and they are interspersed with the established local constructive traditions producing an artistic miscegenation called Mediterranean Gothic.(Zaragozá; Mira 2003:17).

The most representative examples of this typology coincide with the churches started in the period of the Valencian reconquest. But not all responded to the same constructive and structural system (Galarza 1990). However, the term has been consolidated over time and is still used today. Examples of this are the churches of Santa Catalina Mártir, San Juan de la Cruz, San Andrés, etc.

Figure 3. Convent of San Francisco de Morella Source: Zaragoza; Mira (2003).

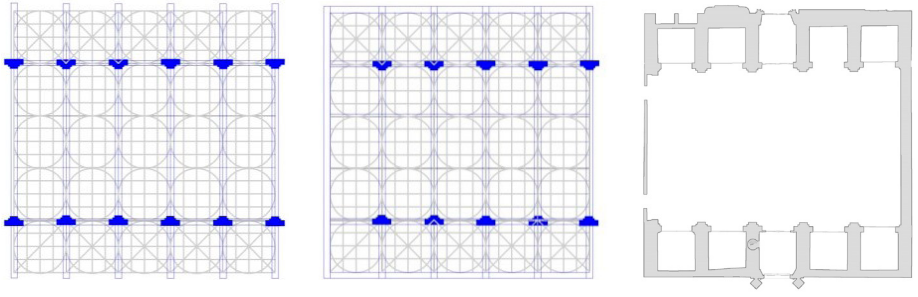


Figure 2. Hypothesis of the first floor of the temple Source: Molines (2015).

Among the particularities that they present, the most significant is their constructive definition, represented by the diaphragm arches. The architecture of diaphragm arches is defined by the construction of a series of factory arches, arranged transverse to the main axis of the building, equidistant from each other and capable of supporting the roof, normally made of wood (Zaragozá Catalán 1990).

This system was the one that was usually used after the reconquest. It is an easy assembly system compared to systems with vaults.

However, something similar happens in the Cathedral of Valencia as Llopis refers to in his doctoral thesis, although with some peculiarities, something that is also repeated in the Church of Santos Juanes (Figure 4). It is about the introduction of a hybrid system that could be the result of several transformations. In this way, it takes advantage of the stability of the factory, converting the lack of solidity of the wood thanks to the use of the vault (Llopis 2014).

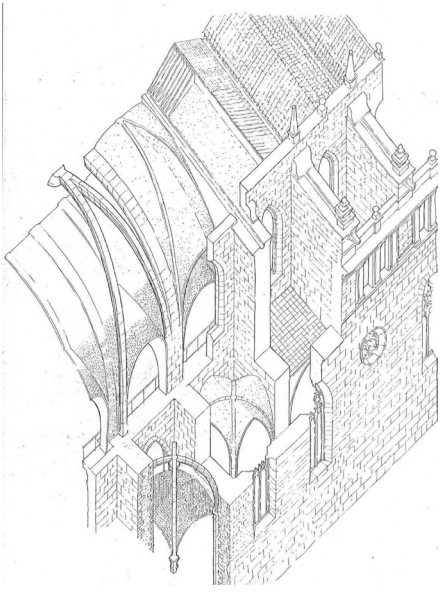


Figure 4. Constructive Sketch . Source: Estellés (1990).

Figure 5. Above system Source: Almargo et al. (2012).

Despite this, it is not known exactly if this is the original configuration or at some point had a wooden roof. Although thanks to the documentary contributions and the sampling extracted by Estellés corroborate that there is no vestige of the existence of a wooden roof. Therefore, if it existed, perhaps it disappeared in one of the fires that affected the temple.

Nevertheless, the interest of this constructive typology is due to the contrast of the Mediterranean ones with their Gothic contemporaries of the rest of Europe, characterized by a structural lightness.

According to Cassinello, the main reason is the close relationship that exists between the seismic map of Europe and the construction of a common Gothic style. The dramatic experiences lived by the inhabitants of each area, leads them to approach constructions based on typologies that had been stable so far. For they understood, although without the current definition that sometimes the earth trembled (Cassinello 2005:249).

Figure 6. Structural system of Santos Juanes.

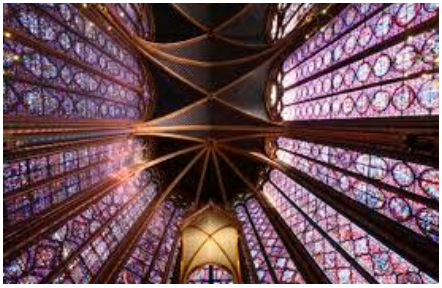
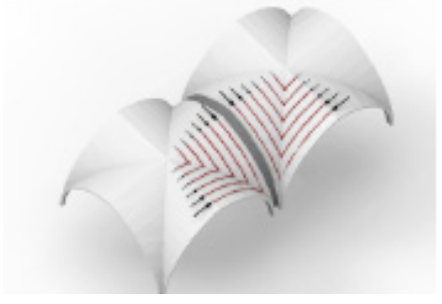


Figure 7. Top View of Saint Chapelle Source: Molines (2015).

The studies carried out by Cassinello are conclusive. She classifies them as skeletons that are "enjutados" or not "enjutados" (Cassinello Plaza 2004), depending on the diaphragm element she calls "enjuta".



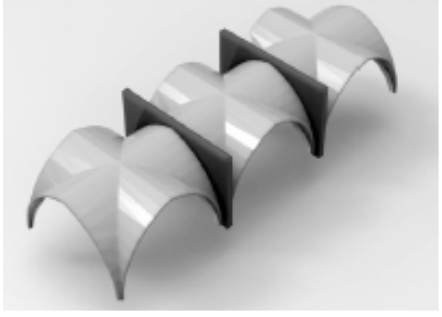


Figure 8. Outline the vaults with diaphragm of the Cathedral of Valencia. Source: Llopis (2014).

Consequently, the first study carried out for this purpose is the one elaborated by Llopis in his doctoral thesis on the Cathedral of Valencia. In it, the validity of Cassinello's statements is verified and the constructive questions raised by Zaragozá are answered:

"We could say that the structure of the Cathedral of Valencia is not Gothic, it presents a diaphragmatic structural system masked by the system of vaults. It is a "hybrid system" that adapts the best of the two constructive typologies"(Llopis 2014).

The answer to the question is because that these elements have the function of supporting the horizontal earthquake efforts. Its construction was planned in these buildings in order to improve the structural behavior in the face of dynamic efforts.
Nonetheless, in the case of the Santos Juanes something similar happens. Even so, the layout of some buttresses with such powerful characteristics, when compared with the flying buttresses of the cathedral, causes the temple to present a much more rigid structure in front of horizontal efforts than other coevals temples.

Figure 9. Cathedral of Tortosa Source: Molines (2015).

Figure 10. Santos Juanes Church. Source: Molines (2015).

These facts demonstrate the great knowledge that teachers had at that time. Consequently, as can be seen in the Gothic buildings around us, they built stable and durable buildings, capable of withstanding any accidental effort. All this thanks to the constructive peculiarities typical of the Mediterranean that allow us to enjoy them today.

3. Conclusions

The different historical passages that have taken place in the city of Valencia affect the evolution that the temple has had since its origins. Specifically and in this case, the Muslim presence and the Reconquest of Jaume I played a fundamental role in the conception of the building we know today.

Consequently, it has been confirmed that the church of San Joan, located in the neighborhood of Boatella, was built following the artistic precepts of the time, the Gothic. However, it has, like other contemporary churches in the city, connotations that differentiate them from the rest of the European Gothic churches.

The answer to this approach is found in the studies carried out by Professor Casinello and subsequently corroborated, through modeling with a finite element program, by Professor Llopis in his doctoral thesis of the Cathedral of Valencia.

However, the excessive dimension of the buttresses of Santos Juanes, which measures 1.20 x 6.00 m in plan, has nothing to do with most of the contemporary buildings built in the Mediterranean area. The flying buttresses that hold these temples, like those of the cathedral of Valencia or Seville, are not comparable in dimension with the massiveness of the Santos Juanes.

Therefore, although the temple of San Juan was built with the precepts that we have termed as Mediterranean Gothic, the configuration of "enjutas", it defined by Professor Casinello, have little impact on the structural behavior of the whole building. Well, although this system does perform its function in the structural set of the building, the addition of these elements, the buttresses, exponentially brace the temple against horizontal stresses

In short, churches built on the same current, the Gothic, but with different characteristics resulting from the experience of the master builders of the moment that made them remain and be the object of study.

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CHAPTER #7.08

DEVELOPING A SYSTEM OF CORRELATIONAL DATA ORGANIZATION AND ASSESSMENT FOR THE PRESERVATION OF THE SPANISH COLONIAL CHURCHES OF THE PHILIPPINES

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1. Introduction

The Philippines' architectural heritage is strongly influenced by its colonial history (Zialcita, 2005). Although the countryside is still peppered with the characteristic folk architecture of the region---light structures with high-pitched roofs and built on stilts---unlike its Southeast Asian neighbors, the Philippines doesn't have great temples of Indian, Khmer, or Burmese influences. Instead, in the center of almost every town stands a massive stone church replete with symbols of the Catholic faith.

Almost all of these churches are still standing and remain in use. Their resilience is a silent testimony to the care of the faithful who tend to them.

1.1. Challenges to Conservation

Constant challenges to conservation of Spanish colonial churches remain. These spring from two main elements that have shaped its construction tradition during the Spanish colonial period: its geographical setting and construction technology.

The Philippines is part of the Pacific Ring of Fire, and is thus subject to frequent, strong tremors. This had a lasting impact on its colonial architecture—which was constantly refined with each damaging earthquake.

Its tropical location also makes it vulnerable to typhoons, heavy monsoon rains, and flooding. Coupled with the usual river or seaside locations of most Philippine towns and cities, these factors give rise to moisture-related problems in buildings.

Materials were locally-sourced and utilized within a construction system with a strong Hispanic base. Masonry building techniques—which were hitherto unknown to locals—were introduced from Spain and Latin America, as well as carpentry[1] and mill work.

This then produces a hybrid architecture that proves to be a complex conservation problem: an orientalized variant of (a mostly coastal) Ibero-American architecture[2] whose conservation issues have roots in three continents.

Alongside natural threats to built heritage is the natural wear and tear that has sometimes results in structural failure. A holistic understanding of history, building technology and construction, formal and spatial analysis, and engineering data can lead to the a better diagnosis of problems and more effective recommendations of interventions.

1.2. Heritage Conservation in the Philippines

From the time of its settlement by the Spanish in the 16th century to its independence from the Americans in 1945, the safeguarding of built heritage in the Philippines had been relegated to the realm of basic maintenance. Though it can be said that American city planning—specifically for Manila—advocated the preservation of majority of Walled City of the Spanish[3], along with the existing urban layout that included parks, squares, and monumental architecture.

Amidst the reconstruction efforts after World War II, the recently independent Philippine government sought to create a national identity (Ledesma and Guerrero, 1974).

[1]It can be noted that the carpentry systems were mostly based on Spanish models from the 15th century onwards, but the joinery will fluctuate between Iberian and Oriental techniques.

[2]There are similarities in masonry construction as well as in the carpentry work, though the frame construction is enhanced by posts that carry the upper floors and the roof, and makes the timber frame independent from the masonry walls.

[3]Portions of the defensive walls were demolished and the moat filled-in for a more sanitary environment.

Built Heritage Conservation in the Philippines may have formally started with the creation of the National Historical Institute (NHI) in 1965. This supported the notion that the preservation of historic structures was part and parcel of tourism.

In 1972, Presidential Decree 260 recognized the aesthetic values of buildings and urban environments, which paved the way for a better public understanding of the value of built heritage.

With the political unrest that led to the revolution of 1986 which ousted the government of Ferdinand Marcos, it wasn't until 1993, that efforts of both government and private groups eventually put Filipino-Hispanic architecture in the international spotlight with the successful nomination of the Baroque Churches of the Philippines to the list of UNESCO World Heritage Sites. In 1999, the Historic City of Vigan was likewise added to the list.

Finally, in 2009, the Republic Act 10066 or the National Cultural Heritage Act of 2009 was signed into law by former president Gloria Macapagal Arroyo. Although its framework was far from perfect, it provided necessary national legislation to protect heritage.

2. Significance

Although the Heritage Act provided a legal basis for the declaration of heritage structures and for stopping demolitions, local city authorities and developers routinely found loopholes that abet their destruction of heritage. Effective database management coupled with improved site monitoring systems are still very much desired. This is partly being addressed by the National Commission of Culture and the Arts through its "Philippine Registry of Cultural Properties".

Technology has provided us with various ways with which to examine and interpret building conditions. Current methodologies rely heavily upon detailed engineering studies to examine the present status of a building and become the basis for the formulation of interventions. However, there is a further need to examine heritage structuresin a holistic manner---to reconcile modern data with the history of construction and interventions of a given heritage structure.

There is a need to provide baseline data for each church. This data will be an amalgam of historical research, timelines, analysis of building technology[4], formal and spatial analysis, as well as determining the architectural character, influences, and connections of the building. This baseline data will then be correlated with other engineering studies as well as the conditions survey in order to arrive at a holistic understanding of the interventions needed (see Fig.1).

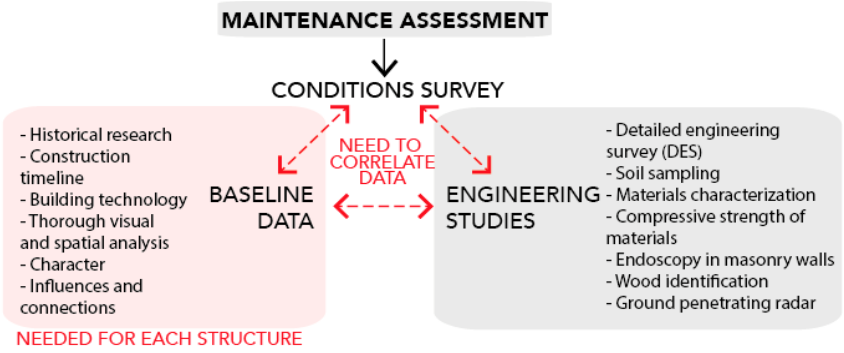

Figure 1. This shows the kind of holistic baseline data gathering and analysis that is needed for each structure.

[4]It must be said that the lack of new data in the historical analysis of heritage buildings – particularly those from the Spanish Colonial period – stem from the decline in the use of the Spanish language in the Philippines, this having been effectively replaced by English as the *lingua franca*. This problem is made even worse by the destruction of a huge part of the country's national archives and many local and church archives in last World War.

3. Methodology and Analysis

3.1. Overview

This study relied on two major methods of inquiry. The first necessitated a wide sweep of historical research form various primary and secondary sources, including official inspection reports from the assigned national cultural agencies. This data was tabulated, color-coded, and tagged. This was especially useful in formulating the construction outline.
The second part consisted of thorough conditions survey reports. This necessitated site inspections, visual surveys, and documentation. Different defects were noted and classified using the same location tags as the historical data. Using the same tags made it easy to cross-reference between different sets of data.

3.2. Construction Timeline

Although there is an abundance of available historical data, most deals with people and events. While these are also significant, they often do not take into account the building's construction timeline. There is a need to take note of physical interventions made over time in order to evaluate their long-term effects upon the structure. Thus, new ways of studying and evaluating built heritage structures need to be explored.
In order to easily store and access the data, the historic construction timeline was built upon a tabular format (see Fig. 2).
In making the construction timeline, it was important to create parallel studies on the construction technology that was prevalent in a locality/region in a given period. As there is a lack of data on materials and construction systems that is arranged chronologically and per region, primary and secondary data sources were reviewed, coupled with a survey of other similar typologies.

3.3. Tagging

For ease of use, the church has been divided into standardized sections as follows: (1) Narthex; (2) Nave; (3) Transept; (4) Apse; (5) Roof; (6) Buttresses; (7) Belfry; and (8) Convent and other buildings. To further detail these sections, they are also classified into left and right sections, as well as interior and exterior areas. This tagging system is recommended for use in the engineering and conditions assessments reports in order to easily cross-examine the available data.

3.4. Classifications: Designating Priority Areas

In assessing damage and determining which areas need immediate attention, the following priority categories are being used:

(a) Minor deterioration – These portions have been under maintenance, and are in fair to good repair;

(b) Moderate deterioration – These areas exhibit slow decay. They are in fairly good repair, but may pose serious damage in the future. It is recommended that they be addressed to prevent major damage;

(c) Major deterioration – These pose the risk of further rapid deterioration or loss of building fabric and need immediate actions or solutions

4. Results

Using this methodology, the following churches were surveyed:
(1) San Agustin, Intramuros, Manila;
(2) San Agustin, Paoay, Ilocos Norte;
(3) Nuestra Señora de la Asuncion in Santa Maria, Ilocos Sur;
(4) Church of Santo Tomas de Villanueva in Miagao, Iloilo; and the
(5) Metropolitan Cathedral of Vigan
In this paper, we focus on Miagao Church to present examples of research methods and correlation of data.

4.1. Miagao

The Church of Santo Tomas de Villanueva in Miagao, Iloilo is one of the four churches included in the UNESCO WHS Baroque Churches of the Philippines inscription. The church was completed in 1797 and was declared a National Shrine in 1973. Aside from the Heritage Law, the church is further protected by Municipal Ordinance No. 03 (An Ordinance providing for the protection and preservation of Heritage

Resources and Tourism Sites and Landmarks within the Municipality of Miagao).

4.1.1. Historical

The current church is the third to be built in the area, the previous two having been burned down and looted by pirates. According to Failagao (1980), when the church was completed in 1797, the tower to the left of the facade was lower than the one on the right. The left belfry was added in 1830, thirty-three years after the church was built. In 1839, Fr. Francisco Perez added one more story to the left tower so that both towers would be equal in height.
In 1976, after it was declared a National Shrine, the church roof was repaired and the cement plastering was removed. In 1979, the use of wrong intervention techniques resulted in smooth, unrealistic, and inauthentic marks on the façade. These were readily rectified by the National Historical Institute using details from a 1898 photograph sourced in Australia.
The church survived two strong earthquakes (1855 and 1948) as well as the Philippine-American War.

4.1.2. Conditions survey

4.1.2.1. Moderate deterioration

Water filtration has caused problems in other areas of the structure, namely:

- Water filtration from the buttresses
- Rising Damp
- Leaks from defective roofs and gutters
- Filtration from cornices
- Reinforced Concrete (RC) to Unreinforced Masonry (URM) connections of the choirloft to the masonry wall

CONSOLIDATED TIMELINE FOR MIAGAO

Year Started	Description	Reference
1580	Augustinian priests from Oton were serving Miagao	
1731	When Miag-ao became a parish, the mission station of the Augustinians there built a simple church and convento (rectory).	Philippines Living Landscapes and Cultural Landmarks by Villaron, 2005
1734	The town was formerly located in Ubos, a lowland plateau by the sea surrounded by mountains.	
	(15 May) Miagao was officially created as a parroquia	Failagao, 1979, P.117
	A church, a convent and a municipal house were built in Ubos	*A Vait.*, Leg. 3955
1741	The church was burned down by pirates	
1743	The town's first parish church was constructed in Ubos by Nicolas Pangkug, first captain of the town. The church was completed three years before the first Spanish priest came	Failagao, 1979
1744	(1750 end) Fr. Fernando Camporredondo built another church, a second one, during his second term	Fernandez, Monografias, in AHHA., XVII, P.41; Failagao, History of Miagao, P.117
1746	(1747 end) The second church was constructed under the leadership of Parish Priest Fray Fernando Camporedondo	Failagao, 1979
1754	The second structure was burned down by pirates, most probably during the looting of the town	Fernandez, Monografias, in AHHA., XVII, P.41; Failagao, History of Miagao, P.118
2005	(11 Jul) Letter to Archbishop Lagdameo informing him of the completion of the Detailed Engineering Study for the Miagao Church. DES was turned over to Archbishop's Palace in Jaro on 9 Sept same year.	NCCA HO
2006	(29 Aug) Letter from Miagao LGU to NCCA requesting immediate attention to the restoration of the church since the walls are already leaking due to drainage system mishap.	NCCA HO
	Mentions of the installation of the carillion bells but unclear when it was really installed. Indications of 22 Sep is noted.	NCCA HO
2009	Congress enacted RA 10066 known as National Cultural Heritage Act of 2009	Proposed Restoration of Sto Tomas de Villanueva Church; NCCA HO
2010	(Oct) UNESCO conducts retrospective inventory project for WHS within 1978-1998	NCCA HO
	SB of Miagao enacted Ordinance No. 03 S of 2010 for the protection of Heritage Resources and Tourism Sites.	Proposed Restoration of Sto Tomas de Villanueva Church; NCCA HO

LEGEND

History
Construction
Disaster
Conservation / Interventions
Aethetics

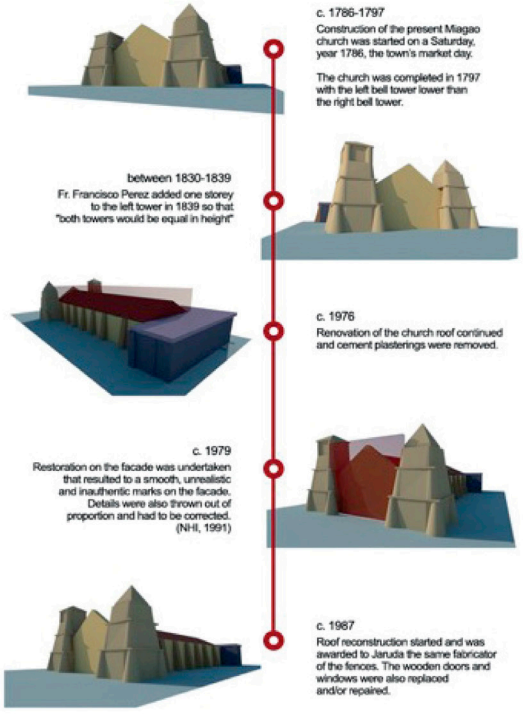

Figure 2. Graphic showing the formal construction development of Miagao church. Data was divided into year, description, and reference. The data was further color-coded and formal graphical representations were devised for easy understanding.

Figures 3-4. (top) Façade of Miagao Church; (bottom) Pulverization of stone and efflorescence on the vault at the second level of the right bell tower at the entrance from the choirloft. (Photo by Theo John Residilla, Dec. 2017).

4.1.2.2. Major deterioration

Severe deterioration of the stone vaulting of both bell towers is, by far, the most urgent. Given the severe water filtration from the upper floor, a sizable portion of the stone vaulting has suffered, resulting in the disintegration of the masonry elements, and loss of mortar. It should be noted that this is a grave structural concern as the vault is a main structural element of the tower (see Fig. 4).

4.1.3. Correlation and analysis

One major drawback of previous historical data was that usually focused on events that occurred during the Spanish colonial period and rarely took into context contemporary interventions. However, having a complete construction timeline is useful in evaluating conditions assessment data. For example, given the major deterioration present in the stone vaulting of both bell towers in Miagao, a study of the construction timeline makes it apparent that although there have been numerous interventions to the façade, roof, and church interior, almost no work has been done on the bell towers. This is substantiated by periodic assessment reports over the past decades. Most reports take note of the façade and the interior, but they fail to highlight the conditions assessment of all parts of the church. This easily accounts for the woeful state of the bell towers.

While it is true that the façade (see Fig. 3) is easily the most striking feature of the church, it is also affected by the structural deficiencies of adjacent structures, such as the towers on both sides. This underscores the need for a holistic assessment and evaluation of the structure.

The importance of the bell towers of Miagao is further underscored by a comparison of construction system data of the other Philippine baroque churches. The towers of Miagao have a barrel vault over the lowest level which in turn carries a planted pillar from which the vaulting of the second level originates. This is also connected to the four walls of the tower. This could only have been established by proper organization, tagging, and subsequemt correlation of historical, construction, and conditions assessment data.

5. Recommendations

In conclusion, we recognize that each heritage conservation project requires a different combination of techniques and intervention approaches. This being said, there is also a need to level the playing field to encourage collaboration between all stakeholders.

First, in order to effectively conserve built cultural heritage in the Philippines, there is a need to standardize the collection and presentation of data. The data used for this project has long been available, but it is difficult to access and synthesize because it is located in different agencies and institutions. Moreover, previous historical data analysis only highlighted people and events, and was presented in narrative form, as opposed to an easily understable contruction timeline.

Second, all heritage structures have to consider building their own easily digestible construction timeline for use in understanding the physical deterioration of the church vis-à-vis evaluating

conservation proposals as well as in times of crisis. Tagging and classifying data, as well as using tabular formats allows easy comprehension of the situation across various platforms.

In conservation of built cultural heritage, there is no greater basis than data. However, we must remember that for data to be effectively used, we must first make it accessible and manageable. It is hoped that the methods introduced in this paper may be further adapted in the management of built heritage sites in the Philippines.

6. Acknowledgements

The authors would like to acknowledge the following for their invaluable help during this project: L. Capellan, T.J. Residilla, R.A. Mabunga, D. Quan, J. D. Destajo, B. Hurtado for their efforts in gathering and classifying data; the National Museum, National Historical Commission of the Philippines, the National Commission for Culture and the Arts, and Digiscript Philippines, Inc. for opening up their archives to the team.

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CHAPTER #7.09

PIRANESI AND HIS SCHOOL. THE INVENTION OF ANCIENT

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"The Villa was the grave of journeys … Each building rose on the drawing of a dream."[1]

The analogy theme forms the basis of the ideological definition which the project Villa Adriana - as created by its 'architect', emperor Adriano - conveys; a cultural creation that turns into architectural shapes an ambitious material and spiritual program, by combining, inextricably, in a wise, meticulous and precise structure both the particular features of the location and the changes made by the human intervention for its physical and mental well-being.

It can be, therefore, considered as an *ante litteram* museum of history, witnessing the experience of classic architecture, made up by some of the most significant elements of roman and greek-hellenistic tradition, quoted, evoked or reallocated together with findings of journeys and Hadrian recollection.

Its rediscovery, after ages of abandonment, happened recently, at the beginning of the Renaissance era, a period of profound theoretical and critical review of architecture, a time during which the studies of the ancient and simultaneously a renewed vision of the relationship between city and countryside, between architecture and landscape, arose together with a classic interpretation of space, supported by the introducton and development of perspective.

Pirro Ligorio is the one that first brings to life the interest towards Villa Adriana during the realisation of the close Villa d'Este. The imperial residence becomes a quarry for the construction materials of the new abode, thus serving as an intangible memorial of shapes and underlying principles preserved among the ruins. Since then, both history and legend mark the entire experience of architecture, to the extent that its map, its settlements, its image have all become a consolidated reference point for many architects who have here grasped the aim of constructions and decorum through the study and discovery of the true: thanks to Villa Adriana *"architecture went back to wear the forms of ancient."* [2]

Raffaello himself - focusing on the retrieval of the *"beautiful shapes of the ancient sites"*[3] -visited most certainly many of the Rome and surrounding excavations and maybe Villa Adriana itself.

Pietro Bembo - Leone X's secretary - in a letter to Cardinal Bernardo Dovizi da Bibbiena writes about a trip of the Sanzio to Tivoli, a confirmation of this event can be seen in a guide of ancient Rome published in the second half of the 17th century by Deuersin and Cesaretti.[4]

Raffaello *"searched the beautiful antiquities which could be found throughout the vineyard and I designed them by my own hand"*[5] , through the findings of the truth, enriched his formal architectural protfolio; he managed his duty as a supervisor by providing marble to the Fabbrica of San Pietro.[6] It seems that he was also involved in the realisation of two modern and unedited works for the era: a design of *Antichità dell'Urbe* - commissioned by Leone X *"in order to leave for posterity a proof, an image, a shadow of what*

[1] Yourcenar, M. (1951). *Mémoires d'Hadrien suivi de Carnets de notes de Mémoire d'Adrien*. Paris: Librairie Plon.

[2] Ojetti, R. (1883). *Discorso su Raffaello Sanzio architetto*. Rome: Tipografia Fratelli Centenari.

[3] Sanzio, R. (1514). *Lettera a Baldassarre Castiglione. "Ma io mi levo col pensier più alto. Vorrei trovar le belle forme degli edifici antichi, né so se il volo sarà d'Icaro. Me ne porge una gran luce Vitruvio, ma non tanto che mi basti"*; in Ray, S. (1974). *Raffaello architetto. Linguaggio artistico e ideologia nel Rinascimento romano*. Rome: Laterza.

[4] *"Outside Rome, next to the famous ruins of Villa Adriana, in Tivoli, some of the vestiges of the best century of painting could be admired, but today nothing is visible they were tearen apart. [...] in this villa of Hadrian outstanding from its ruins and in others in Rome, Raffaello da Urbino, Giulio Romano managed to study them on time, thus conserving said ruins for those willing to see them, admire them in the lodges of the Vatican palace led by Giouanni da Vdine, and Raffaello's disciples; together with Madama a Monte Mario vineyard, in Mantoua in the T palace and other works of Giulio Romano."*, in Deuersin, B., Cesaretti, F. (1664). *Nota delli Musei, Librerie, Gallerie, et Ornamenti di Statue e Pitture ne' Palazzi, nelle Case, e ne' Giardini di Roma*, Rome: Stamperia del Falco.

[5] Letter of Raffaello to Fabio Calvo (15 august 1514): *"Siamo iti in questi dì ciercando le belle anticalie (che) stanno per queste vignie, e le retraggo de mia mano per ordine de nostro signore* (Leone X)", in Ray, S (1974). *op. cit.*

was the home of all Christians"[7] - and a treaty, *per exempla*, extremely different from Vitruvio's. Both projects remained unfinished because of his premature death but - even though we do not own a concrete proof of them[8] - they were well known to his contemporaries, to the extent that they actually influenced significanlty the architectonical culture of the time and the consequent genre, for more than 50 years in the *I quattro di Libri* of Palladio[9] , and more than two centuries the cartographic portrayal of Piranesi, only two of the most eminent paradigms of the literature and iconography of the late Renaissance and Enlightenment.

By following the steps of Raffaello, both Palladio and Piranesi shared particular interest in the ancient and more specifically in Villa Adriana. The first manages to find here the formal truth of his treaty and his entire work. The latter, through his *Vedute di Roma* (1748) and the series *Antichità romane* (1756) gives us back a faithful representation of a world in ruins. However, Piranesi's inscriptions never give up to nostalgic and romantic tones because of the risk of losing the perfection and very own definition of architecture; on the contrary they contain a perspective of leading towards the new which conveys the expressive strength of fragment, the virtual occasion linked to the incompleteness of ruins and mutilated shapes hanged, wainting for future fullness. This positivistic vision emerges with higher strength mostly in his *Pianta delle fabbriche esistenti in Villa Adriana*[10] which does not only represent a faithful restitution of the site plan through his fundamental features (soil, ruins, hidrography, vegetation) - also following his predecessor Contini[11] whose design Piranesi recreates in an updated and reviewed version - but he also presents an hypotesis of analytical restitution on the basis of evidence and new beginnings. His *Pianta* highlights a dual principle: for the destiny of the Villa itself and, more in general, for architecture as a discpline which following this experience, renews its method and planning.

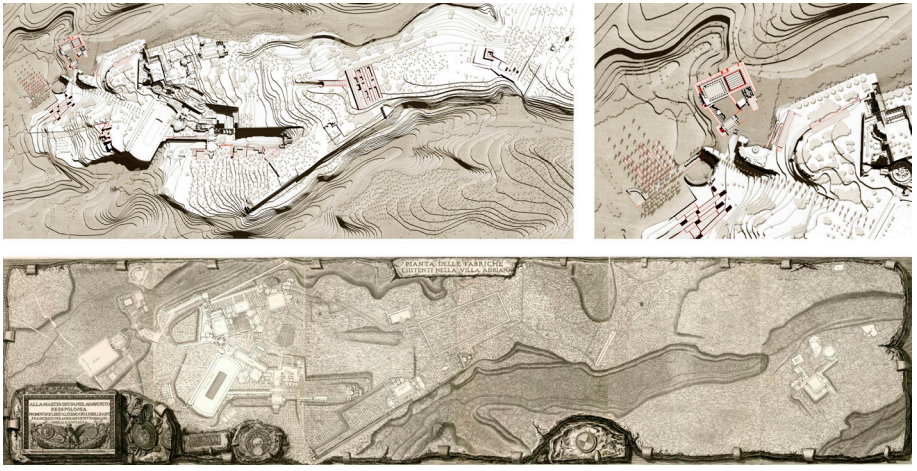

Figure 1. The 'new' Pianta delle fabbriche esistenti in Villa Adriana. Baccetti G., Nespoli A, Tolve V. (2015-2016).

[6]Raffaello is officially in charge of directing the works at the Fabbrica di San Pietro appointed by Leone X with a letter written on 1st august 1514, together with Giuliano da Sangallo and Fra Giocondo da Verona, already associates of Donato Bramante, Raffaello's predecessor. With another legal act of 27 august 1515 he is appointed Commissioner to the Antiquities, with the duty of supervising the excavations not only for their preservation, but mostly for the sieving of the veneering materials, by following a a common and widespread practice.

[7]Sanzio, R. (attribution and dating are uncertain, but reliable) *Memoria a Leone X,* in Ray, S. (1974). *op. cit.*

[8]His friend and humanist advisor Fabio Calvo published posthumously (1532) the volume *Antiquae vrbis Romae cum regionibus simulachrum*, generalmente considered the litereray complement of Rome's map designed by Raffaello and never retrieved.

[9]Palladio, A. (1570). *I Quattro Libri dell'Architettura*. Venice.

[10]Piranesi, G. B. (1781). *Pianta delle fabbriche esistenti in Villa Adriana.*

[11]Contini, F. (1634-1668). *Dechiaratione generale della pianta della Villa Adriana.*

For this reason - non lacking the advisable strains - it can be stated that Piranesi has contributed to the growth of modern and contemporary architecture through his work. He created a school of thought, by defining a genealogical descent from Palladio, Bramante and Raffaello (only to bring to mind some of them), continues with the *Ecole des Beaux Arts* (through the *Prix de Rome*) and keeps on going with the entire generation of the Modern Masters (Lewerentz, Le Corbusier, Kahn; without any suggestion of completeness) which during the 19th and 20th century have brought to life a process of critical revision of all values of classical tradition, following the self-study *Voyage en Orient* of corbuserian inspiration.

We can also include contemporary architects, or better, the ones who share the belief that reflecting on tradition and its values, reasoning backwards through history and the experience of architecture, results in the research of its constants, not for imitation, but for the purpose of a critical revision accordingly to the needs of reinterpretation and rewriting, on which the concept of tradition itself relies on (*traere*, obtain). This represents, thus, the premise for its actualisation compared to the problems of the contemporary artistic work.

Besides the evidence of shapes, the following principle matters: *"architecture, besides the shapes in which it emerges, is the idea expressed by those shapes. It's the materialised idea with scales that relate to people, centre of architecture. It's the built idea, Architecture's history, far from being just a history of shapes, it's fondamentally a history of built ideas. Shapes vanish throughout time, but ideas stay, they are eternal"*.[12]

Following the previous statement it is clear that the most profound value of tradition is none the less linked to the most essential aspect of modern era.

This way of thinking has influenced research and planning experiments which during many years have been carried out in Villa Adriana, for both trying to solve specific matters linked to the use and conservation of the site and, more in general, showing solutions aiming at a disciplinary principle and method for designing in a continuous flow with antiquity.

The most recent among these experiences was the turning point regarding the area '*Palestre*', subject to recent excavation which brought to life the whole sediment, conferming mostly the hypothesis of Contini and Piranesi and allowing the discovey of one of the less known compounds, up to questioning the denomination itself, linked in the past with the retrieval of athletes statues.

Although the compound has not yet been fully comprehended - morfologically typologically, functionally - several reconstructive hypothesis have been carried out which, even though partially, confirm the structuring in *"quattro alloggiamenti"* as supported by Ligorio and the link with the ground of *Pantanello, Teatro Greco, Tempio di Venere Cnidia* and the principle of *Valle di Tempe*. The four sections are further divided into serveral buildings, all joint one whith eachother.

Building n.I (north-west) matches perfectly with the land of the first area, its perimeter is made up by a substructive base containing service environments at the hypogeum floor; a central covered space rose on these cryptoporticus, surrounded by a double span colonnade which mediates the connection with the outdoor and the opening onto the landscape. Building n.III (south-est) also occupies the whole surface of its area: moreover it confirms both the orientation throughout the north-west/south-est axis of this first plant, and the typological definition and morfological setting with a central space, this time uncovered.

Building n.II (west) is made up by a lounge improperly called 'ipostila', which actually is ispired by a traditional three-aisled basilical plan; only the mosaic floor and the staircase to access which mediates the difference in height of the Pantanello level ground and the mezzanine floor of the Palestre have been retrieved. The morfological fracture between this hall (perpendicular to *Teatro Greco*) and building n.I (paralel to *Valle di Tempe)* is mediated by a trapezoidal gap probably with the function of a hanging garden, pending from the supporting

[12]Baeza, A. C. (1996). *La idea construida. La Arquitectura a la Luz de las Palabras*, Madrid: Coam.

structures of vaulted halls encraved in the basement gauge.
The last quadrant (est) is composed by three buildings (n.IV, n.V and n.VI): two cruciform rooms with vaults (n.IV and n.VI) linked together by a rectangular hall (n.V).
From the excavation and the reconstructive hypothesis described, the project proposal imagines in this compound a new exhibition space as a permanent museum of the archeological building site: the new museum would be created next to the Villa entrance and, besides displaying the very own architecture of the *Palestre* - aim of the excavation work and restoration - it would welcome temporary exhibitions besides the permanent collection of statues and manufacts found on the site. Space definition and paths follow the morfological and typological setting inferred by the evidence of excavation.

The visit will be divided into two different paths in the compound, at *Pantanello* floor and on the superior site defined by the builduing substructures; the junction between them is the monumental staircase of *'Sala ipostila'*, at west and, at north a new *'cordonata'* joint with the soil inclination and in line with the blind spot of substructure in buildings n.I and n.II.
The topographic variation intrinsic to this architecture, becomes the founding theme of the project which carries out in the tight connexion 'above-ground' and 'under-ground'.
Spaces of the new museum define themselves in the soil - inside the basement occupied by areas I and II, by reviving both a theme and a construction technique already present in many parts of Villa Adriana (substructures of *Cento Camerelle*, the *Pretorio* and the *Antiquarium,* for example) - and on the site above the artifical horizon created by the substructures themselves.

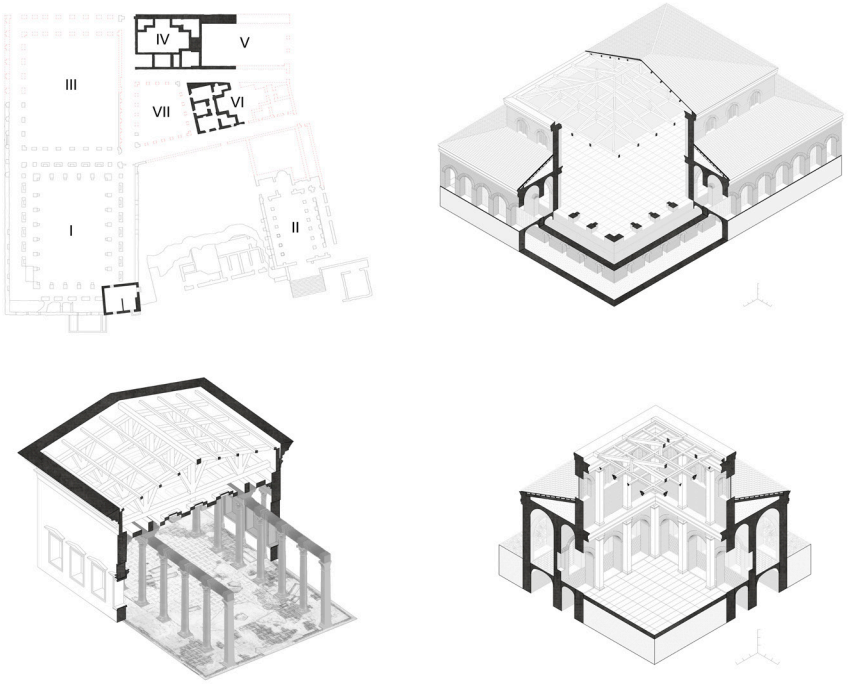

Figure 2. Reconstructive drawings. Baccetti G., Nespoli A, Tolve V. (2015-2016).

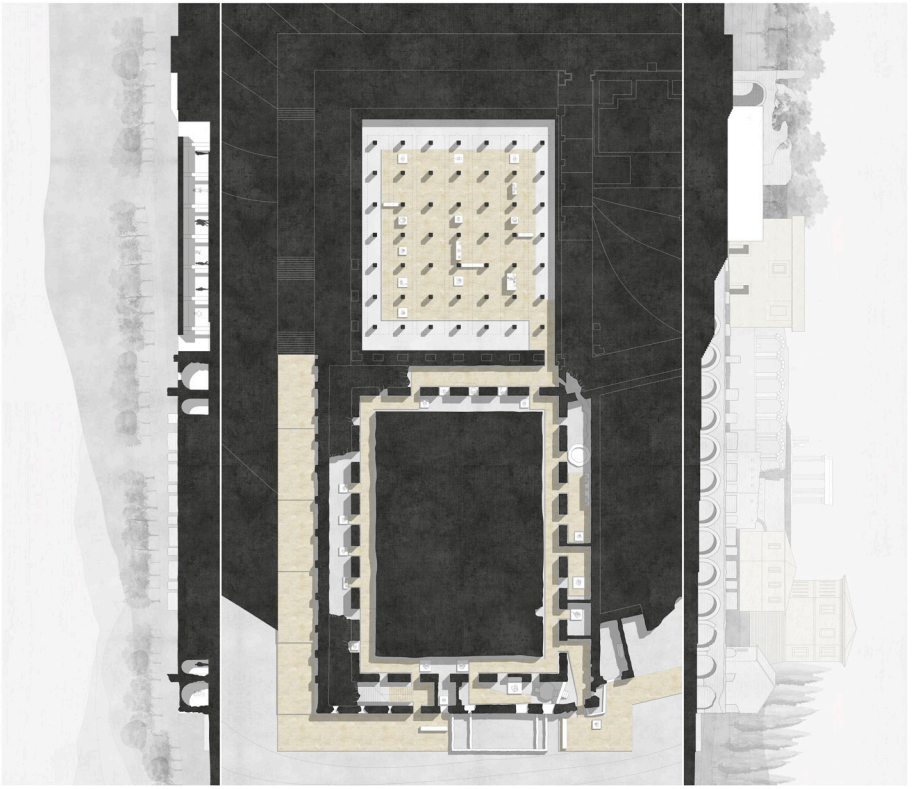

Figure 3. The Museum of 'Palestre' in the 'under-ground' level. Baccetti G., Nespoli A, Tolve V. (2015-2016).

On the 'above-ground' the project introduces a visit itinerary which redefines the system of distance of the original porches and includes the rest of the mosaic pavement found in the '*Sala ipostila*' and in the central covered area of building n.I, recreating the original, formal and geometrical completion of the '*quattro allogiamenti*'. The new pavement is conceived as a stone cladding carpet and the new insert, based on microcement, selected small aggregates of the same colour as the mosaic tiles. A biodegredabile resin finish completes the top layer and guarantees not only a continuative path, but also a proper protection for the remainings of the original pavement.

On the 'under-ground' criptoporticus are retrieved, re-opened to public and equipped. The perimetral gallery system frees small expository rooms encraved under the most external superior porch and leads to a new '*Sala ipostila*', at the same height of the hypogeum paths, by digging the space of the original courtyard of building n.II. This new room alludes to the gymnastic use of the compound: a water perimeter surrounds the central paved surface equipped with athletes'statues placed among hypostyle pillars which support the covering sheets placed at different heights. This structure, as conceived, guarantees the proper protection and a balanced relation between shadow and light, by evoking the space of the ancient yard as if it were sheltered by a *velarium*.

In conclusion the project reasons in terms of invention, following the construction of the Villa

in accordance with its very own ontological and founding nature, where the incompletion of its ruins - studied, valued and interpreted - give the chance of updating, changing (and adding) the test already outlined by Adriano.

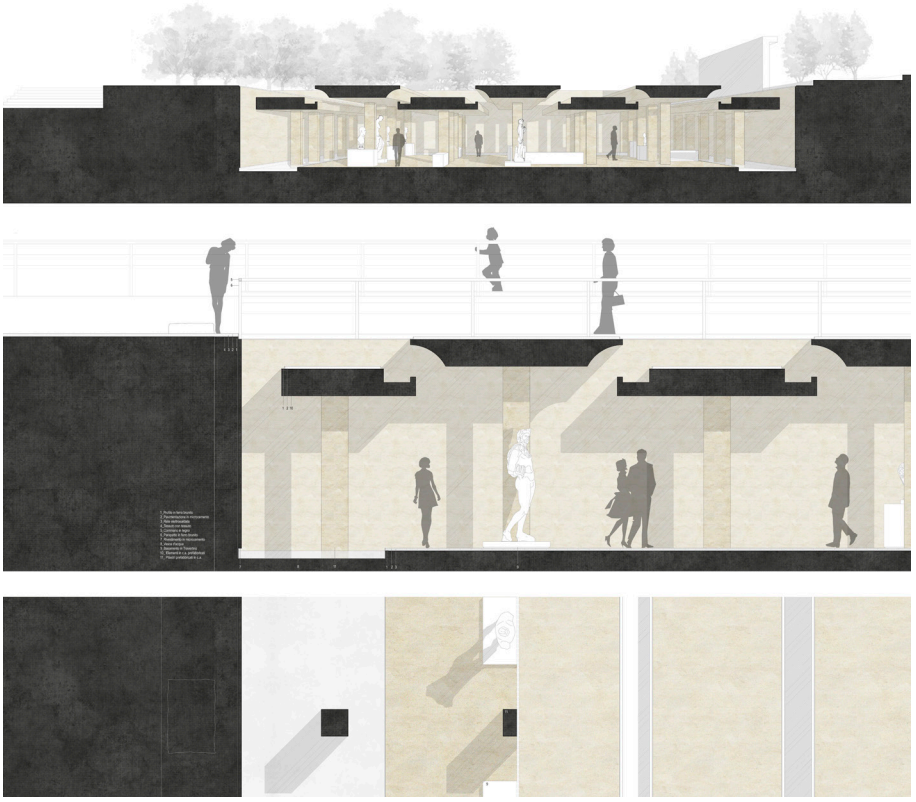

Figure 4. The Museum of 'Palestre'. Perspective view and details. Baccetti G., Nespoli A, Tolve V. (2015-2016).

CHAPTER #7.10

SARDINIAN CIVIL ARCHITECTURE IN THE SECOND HALF OF THE 18TH CENTURY

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VALi+d program from the Generalitat Valenciana, co-financed by the European Social Fund.

1. From *Castrum Kalaris* to Càller, the main city of Sardinia through the centuries

The history of Cagliari is deeply bounded to the history of Sardinia, and it has been under the rule of several states, cultures and sovereigns since its foundation. Located in a broad bay and facing the south, it's a natural strategic point of the island, which was noticed by the Phoenicians, one of the firsts settlers of the historic city. During the years, it changed hands from time to time, but one of the greatests power changes it suffered took place at the beginning of the 14th century, when the Aragonese troops conquer the city and defeated the Pisa forces. This was not an easy conquest: the invaders camped in the nearby *Bonaria* town, and during three years they tried to break and surpass the *Castrum Castri* or *Catrum Kalaris* walls. At the time, the city was mainly its castle, and next to it were the small villages of *Stampace*, *Villanova* and the portuary neighborhood of *Liapola* (later called *Marina*) (Alonso, 1977; Guia, 2015; Unknown, 1942).

The Aragonese started immediately to upgrade the defenses of the city, and gave it a urban structure, based mainly in the municipal model of Catalonia, turning the so called *Castell de Càller* into the seat of their rule in the island. Soon, the city started to receive new settlers, as the previous ones were cast out. The new inhabitants came from the other Iberian Aragonese realms: Valencia, the county of Catalonia and Aragon itself (Guia, 2015; Manconi, 2010; Unknown, 1942).

During the time that the bloody war for the total control of the island lasted, the new power in the island funded several new military constructions and stablished patrols around the most important and strategic points. The one that received, in this matter, most of the attention was, again, *Castell de Càller* (Guia, 2015). This points as an early proof of the importance the city already had, and the key it will be in order to have the complete rule over the Mediterranean island.

The conflict in Sardinia between the pugnacious factions ended in the two firsts decades of the 15th century, when the last surviving party against the Aragonese, the *Giudicato di Arborea*, capitulate, and thus, their Iberian enemies gained the full control of the isle. Briefly after that, the institutional engine of the new rulers started to take form, stablishing the political functioning of the new realm along with a new feudal system. As a consequence, the first viceroy –Lluis de Pontós– arrived in 1417, setting his permanent residence in Cagliari, now turned into the official and key city of the Kingdom of Sardinia (Floris, 1996; Guia, 2015; Manconi, 2010). Although the so called *Castell de Càller* will have a strong rivalry with Sassari –the other territorial and administrative city of the isle–, its importance as a head of the representational system was unquestionable. In fact, as the Aragonese power consolidated, the relationship between the crown, the city itself and the three estates of the Kingdom –the military or nobility estate, the ecclesiastical and the royal estate– was more and more exclusive (Alonso, 1977; Guia, 2012).

After those events, the city will know a long period of peace, during which it will see a commercial, cultural and demographic development. The commerce was one of the firsts beneficiaries of the end of the conflict, although this improvement affected the Aragonese and Catalonian merchants over the Sardinian ones, who weren't allowed to trade. Later in time, during the 16th century, the business protagonism fell in the hands of the Genovese, followed by other Italian regions, like the Sicilian or Neapolitan (Floris & Serra, 1987;

Manconi, 2010; Unknown, 1942). As a result, the urban area expanded, connecting the *Stampace* and *Villanova* towns with the main castle district. This naturally-elevated area concentrated the most important buildings of the city and the realm, such as the royal palace, the city palace and the cathedral. Futhermore, as the nobility settled in the *Castell*, the merchants moved south, to the *Marina* neighborhood, where the commerce and sea activities took place. This economic movement made this district very important and, as a consequence, the authorities protected it with the expansion of the walls that covered the castle. Nevertheless, these cities and districts would be considered as different, until the arrival of the 17th century, where an effort to join them as one only urban entity took place (Alonso, 1977; Floris & Serra, 1987; Guia, 2015; Unknown, 1942).

It was not until the arrival of the firsts years of the 18th century than the international political issues affected Cagliari notably. With the dead of Charles II, the island became a strategical key in the war and in the negotiations. It was conquered in 1708 by the Habsburg forces, and then again, in 1717, taken back by the Bourbon army during only three years. The war took a heavy toll in the city, that saw her commerce weaken, and her aristocracy exiled into the European courts involved in the war (mostly Madrid or Vienna). After the negotiations, the island became an exchange prize, that switched hands, from the Emperor to the Duke of Savoy, Vittorio Amedeo II, in 1720 (Alonso, 1977; Guia, 2015). After that, the island and its principal city abandoned the Aragonese and Castillian heritage, that had started in the 14th century, beginning a change to an Italianization that would change not only the language, the culture or the politics, but also the aesthetics of the city.

2. The Crown of Aragon impact in the aesthetic Sardinian expression during the 18th century

It cannot be denied that the Savoy culture established in Italy had an enormous influence on the development of the aesthetic patterns and, in a certain way, on the architecture of the early 18th century in Sardinia. So far, it was obvious the distance that existed between Sardinian art and the culture of the Piedmontese Savoy designers. (Schirru, 2008).

However, to know the reasons why these compositional and architectural schemes were developed in the eighteenth century, we have to refer to the influence that had the differents historical antecedents occurred in Sardinia since the late fifteenth and early sixteenth century. Many studies carried out today show the presence in Sardinia of teachers and builders who applied their constructive knowledge learned in other latitudes of the Mediterranean. Something that is corroborated by several buildings of the late fifteenth and early sixteenth century (Nobile, 2002).

The 16th is not characterized precisely by a great construction boom on the island, perhaps caused by the political situation at the time. However, after the second half of the century, an economic recovery and favorable conditions for a new architectural language were developed thanks to the Company of Jesus and military engineers, some of them of Italian origin (Garofano, 2010).

It is evident that the presence of a group of masters from the Italian peninsula, with Hispanic influences and different customs, developed their activity in parallel to the existing traditions on the island, transforming the praxis consolidated until that moment. (Bermejo, 2016). It was a set of military engineers among which we can highlight Giovanni Maria Oligatti, Michele Sammicheli, Girolamo Maggi and Giacomo Castriotto (Maggi; Castriotto, 1982). Their main work at first was to develop defensive projects which, in a certain way, were developed based on the military architecture of Sardinia, to the detriment of the Renaissance aspect in force at that time.

But it was not only a group of soldiers who moved to Sardinia. The enormous demographic decline that struck the area between 1654 and 1656 caused the island to become a zone with certain needs for human capital. In the 18th century, after more than a century of experimentation, modern techniques began to be consolidated. An interesting example, given the high prestige of the work, was the reinforcement of some arches in the pleasure palace of the Royal Venaria, an intervention directed by the architect Giovanni Giacinto Baijs in 1770 (A.S.TO, 1760-1779).

Consequently, and based on the new architectural precepts, the Piedmontese military engineers built valuable examples of military

architecture in modern Sardinia. Among them, Antonio Felice de Vicenti designed the system of bastions and favelas along the north and east flank of the Castello fortress in Cagliari (Cavallo, 1999).

In the second half of the 18th century, the Sardinian society and it infrastructures were affected by a progressive social reorganization, respecting modern principles and techniques. One of the main consequences was the consolidation of a business class formed by aristocrats that offered a greater availability of economic resources. Something that caused a boom in investments in the construction sector, through the construction or rehabilitation of private residences of nobles. However, many of these new architectures did not evolve with their own language. Rather, they imitated Baroque aesthetic canons strongly influenced by the work of Savoy's military engineers. Therefore, the modernization of Sardinian reality in the eighteenth century received a remarkable boost from the initiatives of the government of Savoy, which developed a vast program of reforms under the guidelines of Minister Giovanni Lorenzo Bogino (Schirru, 2008).

3. The *Castello* district in Cagliari. A clear exemple of the Piedmont influence

One of the most characteristic neighborhoods of the city of Cagliari is *Castello*. Given its historical characteristics within the capital, it was the preferred place for the nobility to settle since the Middle Ages. As mention before, the district housed the most important examples of civil architecture in the city, as well as other buildings of importance such as the cathedral or the seat of the bishopric.

One of the first civil buildings composed according to the criteria of late Piedmontese baroque architecture is the University of Cagliari. (A.S.C.A. Vol. 799). Located in the neighborhood of *Castello*, it is one of the most important buildings built by the Savoy administration in the 18th century and it's part of the so-called reformism of the Enlightenment, modifying the appearance of the historic center of Cagliari.

Figure 1. University of Cagliari. Source: Schirru (2008).

The facade, simple and linear, includes three orders of windows, the first characterized by an outgoing cornice and the second by a curvilinear tympanum. The large stone portal opens onto the atrium, which leads to the square central courtyard. A double symmetrical staircase from the patio leads to the rear bastion, while a simple lateral staircase leads to the upper floors, where the assembly hall with a coffered ceiling.
Other buildings built at this time in Cagliari also aroused great interest in the city. Concretely the palaces destined to the nobility, that little by little were weaving the district of *Castello* as we know it at present. Among them we can highlight the Palazzo Nieddu. Inherited by the Nieddu, Cugia and Amat families of San Filippo between the 19th and 20th centuries. The palace stands out for its dimensions in reference to the main noble houses of the city.
Regarding its construction, the origin is not known in detail, but it can be corroborated that it has been subject to numerous reforms. The most important in the eighteenth century adapting to the late-Baroque current of the moment.

Figure 2. Palazzo Nieddu o Cugia. Source: http://www.cagliariturismo.it/it/luoghi/i-luoghi-della-storia-316/palazzi-storici-163/palazzo-cugia-229 (2018).

The sacred architecture and other urban spaces of the Castello district within the city of Cagliari also underwent transformations. Among them, l'antica plasuela fu teatro, one of the most significant open spaces in the neighborhood, underwent notable reforms. A clear example is the redesign of the buildings that made up the plaza itself.
The historical archive of the city is a reflection of these alterations and shows various works contracts dating from the 18th century. Some of them are il palazzo Solinas, owned by the Marquis of Sedilo and a little further away, il palazzo di don Giovanni Antonio Borro, former bishop of Bosca and dean at that time of the cathedral.
However, not all the buildings of that time maintain their characteristics more or less intact as in the case of Palazzo Nieddu. Some of them suffered the attacks of the bombings of the Second World War that affected in a latent way the built heritage of the city. Clear example of this was the Palazzo Pes di Villamarina or Palazzo Falqui.
Also in the 18th century, the representative offices of government authorities were subject to modifications according to the canons of the Piedmontese Baroque vocabulary. Specifically the palazzo della città and the pallazo viceregio were subject to renewal. These constructive adaptations did not follow specific planimetric guidelines. Rather they were adapted in an attempt to establish appropriate spaces for the development of administrative functions that were required (Olla; Pillai, 1981).

Figure 3. Top: P Palazzo della città; Bottom: Pallazo Viceregio. Source: https://www.vistanet.it/2015/03/16/cagliari-palazzo-citta/ (2018).

In short, these are just small examples of the adaptation that the city suffered in the eighteenth century. Small transformations carried out by a huge number of Piedmontese architects that were sent to Cagliari at that time. However, it is difficult to ascertain with certainty the names of all the architects who participated and what measure they influenced in the transformation that the city suffered. However, what is conclusive is the versatility presented by these engineers and architects sent to Sardinia.

4. Conclusions

It is evident after the historical analysis carried out the importance that the 18th century had in Cagliari and, more concretely, in the neighborhood of Castello. The appearance in the panorama of Sardinia of the Savoy and with them of the Piedmontese military caused the city to undergo a radical architectural turn, mainly in private architecture.

While initially, the reasons why this amount of military arrived in Cagliari had as its goal the construction and strengthening of the defensive elements of the city, little by little they were occupying relevant positions within the civil architecture.

But it is certainly difficult to value each and every one of the actions that took place in the city and more specifically to accurately report the contributions made by each of the military engineers who settled on the island at that time.

In spite of this, Cagliari continues to be a clear reference point for Late Baroque architecture, mainly due to the high quality of works of military, civil and religious architecture.

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CHAPTER #7.11

LAWS OF WATER AND LAND ON THE INDUSTRIAL SETUP OF RIVER MOLINAR

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1. The pragmatism of the construction methods

Man produces rules, nature is made of laws. Without the knowledge of the law, without the sense of the law, nothing can be done. Nature produces both. The mind wants things and challenges nature to produce that which expresses the inexpressible, the indefinable, the excessive, that which has no substance, love, hate, nobility. The mind wants to express everything but can do nothing without an instrument. The law is the builder of instruments. We should consider rules modifiable and laws immutable.(Kahn, 1961:5)

the location to get the potential energy of water requires the rationalization of this energy source for all the factories that receive the potential advantage of these hands that the valley gives away. On the other hand the thrust of land on the slopes implies a very severe condition for building, as a result of the strong topographic mark of the small valley of the Molinar (Fig 1).
These two conditions are the laws of water and land and determine the architectural decisions of the industrial setup and confer that high degree of balance between man and nature that explains Cavanilles when he described the

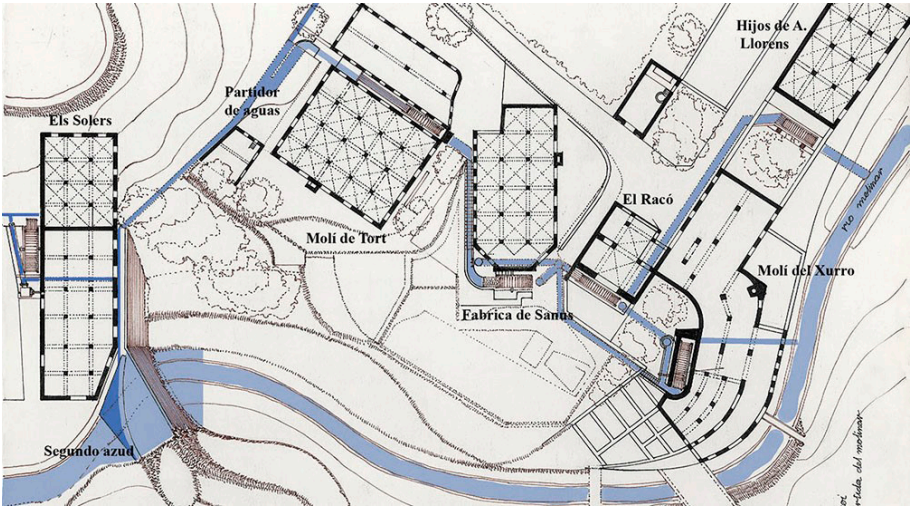

Figure 1. Plan of Molinar factories with the river and water paths that feed the hydraulic wheels of every factory.

Landscape construction along the Molinar river responds to the clear understanding of the natural laws that rule in the place. The laws are immutable and durable so that any architecture with a permanent nature must obey the inherent laws of its site. On one hand the suitability of

ensemble of Molinar at the end of the eighteenth century:
"Barely depart the waters off that circle, and begin to descend into the gorge, find them frequent dams, where they are re directed to the mills, fulling mills and irrigation ditches, and then fall

again into the ravine to move the mills, which in amphitheater continue until the end of the slope … and the crowd of men, women and children busy in serving machines or cultivating the earth, form a nice, alive and picturesque whole, where water and earth serve men usefully, exactly obeying the laws prescribed by the industrious expertise." (Cavanilles, 1797:195)

The buildings must be constructed following rules to obey the laws emanating from the place. Every factory in the Molinar shares some simple rules of construction that are the common basis for architecture to have unity in the landscape. So, while waterfalls regulate the visual cadence between groups of factories along the river about every 8 yards height difference (7.2 m.), the vaults used to counteract the horizontal thrust of the slopes restitute on the first floor a flat service level as firm as the ground floor on earth.

system of measures is based on the valencian palm (22.5 cm) and the valencian yard (90 cm or 4 palms). These measurement units persisted as architects from the Academy of San Carlos maintained its use in continuity with the trades (Fig 3).

Figure 3. Ground floor of 20 palm vaults in Solers factory.

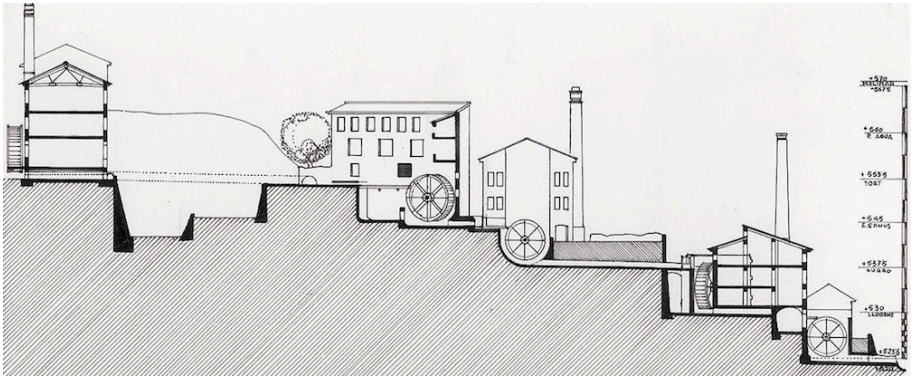

Figure 2. Law of water in the Molinar ensemble. Every wheel gets 7,2 m of water height potential energy.

1.1. The 20 palms vault

The groin vault widespreaded in the valley is constructed with a double threaded board of manual brick (29 x 14 x 3 cm) that starts from the side rabbets of semicircular ashlar arches in both directions measuring 2x2x0,5 palms, supported on ashlar bases measuring one yard wide. Although in the oldest buildings the vaults obey other measures and proportions, these 20 palms vaults are the building pattern used in every ground floor of the Molinar factories. Their

The choice of the groin vault is due to its efficient structural behavior as it responds bidirectionally against horizontal stresses and, as a gravity system, it is very stable against large uniformly distributed loads. However, it is vulnerable to the action of concentrated loads since they modify the funicular polygon of permanent loads that weigh on the double threaded membrane that is responsible for transmitting compression stresses to the pilaster. As the funicular polygon of permanent loads is

incompatible with the geometry of the vault, the stability is achieved "postensioning it" with a uniform additional overload consisting of filling the soffit with high ballast coefficient gravel and the later flooring, forming a monolithic structure, gravitationally stable. With this filling the concentrated overloads of which vault geometry is very sensitive, remain muffled by the disproportionate permanent overload that minimizes the harmful effects thereof. Despite this protection ruin is inevitable when beams or pillars of the upper floors fall on the thin central area of the vault, but they grow more stable when a gradual weight accumulation occurs because the thickness of the growing layer of fallen material also increases the resistance to concentrated dynamic loads.

1.2. The grid of the "enguilat" steel pattern

The rise of a story involved building a floor that, with a span of approximately 4 x 4 m, is transferred from the rural edification where it has been widely tested. This model of structure solved with a unidirectional network of wooden beams and joists with plaster no longer enjoyed the stability of the solid ground and the vaults. It was too elastic, it had a limited load capacity and, eventually, its deformations ruined the flatness that the machines set up on it needed (Fig 4).

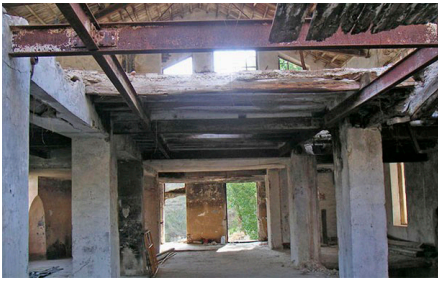

Figure 4. View of the old enguilat grid system.

These disadvantages made it not suitable for an industrial use and led the implementation of a grid of steel beams and joists to stiffen the whole. This additional structure is known as "enguilat" and aims to reduce the span of the wooden joists with the minimum weight of steel. This economic criteria and the intuition of the moment diagram, push the position of the new steel joists to the lines between a fifth and a third of the span of the wooden joists because steel has a far better behaviour to shear stress than wood (Fig 5).

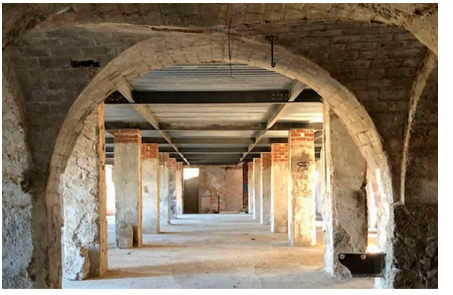

Figure 5. View of the renewed enguilat grid system.

The "enguilat" grid of IPN profiles had been the longest-resistant element in the upper floor since all the wood had become unusable. Furthermore, when intervening it guaranteed the stability of the facade walls as they were braced by IPN 220 beams perpendicular to the facade. The way to reuse in advantage the IPN220 and IPN180 beams that formed the "enguilat" was to reposition these profiles to support the new slab. So the pre-existence of the "enguilat" gave the logical constructive and formal solution to the new composite slab as the disposition of the IPN180 beams was also advantageous for supporting the profiled steel decking.

1.3. The triangulated trusses

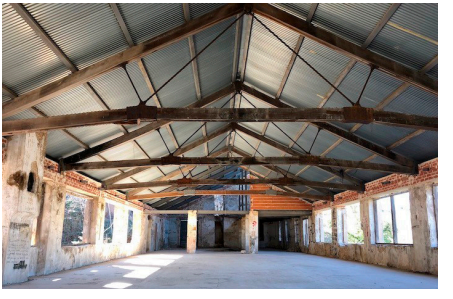

Figure 6. Upper floor with 12m. span trusses in Solers factory.

The need to emulate the top floor of the cotton spinning factories of Bolton (England) to house spinning machines, like the multipurpose Spinning Jenny or the Selfacting Mule, required a typological transformation to get a free plan. The structure of inherited columns is used to support this new floor but, for the new roof, mixed wood and steel 12 meter span trusses are used, as an increasing amount of construction manuals showed different drawings of models for triangulated trusses (Fig 6). Once the engineers were able to calculate the efforts with the elementary graphical statics spread by the school of Cremona and updated by Polonceau and Ritter, theoretical knots and joints were materialized by the craftmen of the workshops with *sui generis* solutions. What makes these trusses so peculiar and particularly characteristic of Els Solers factory are the three visible ironcast knots that put together the wooden pieces and the diagonal steel bars. The interpretation of the construction methods transformed the appearance of the buildings and provided the space that manufacturers needed to receive and install without hindrance large spinning machines.

2. Counter-anastylosis as an architectonic procedure

For the reconstruction of the monuments with a long presence in history anastylosis is the only technique accepted by most of the legislations of Heritage. It is the use of the same demolished materials to be put back to its original position in a sort of a puzzle work. It is a very complex and expensive technique because, if it is not done carefully, any error would create a historic fake, ie, an ahistorical element invented by the addition of historical pieces, which would render even more difficult a later detection of the error. Anastylosis searches literality, not interpretation, and pursues the return to the first arrangement of the original elements in order to enhance the value of the whole. However, the failure to complete the reconstructive process, due to the loss or spoliation of a large number of pieces, fosters debate on its suitability as a method to begin and finish reconstruction or even if it makes sense to do so.

Buildings lacking the weight of History that itself has a Renaissance or a Baroque, must also flee away from the historic fake, but not because of the falsehood of a spontaneous hybridization, but for the falsehood of the iconic imitation. Reconstruction should not be subject to the constructive iconicity, but must find the original construction logic as a way to update the meaning of its past in the present and for a future use. The proper word would be counter-anastylosis because the internal formal unity is produced by the reuse of original material but the overall consistency comes from updating the logic of its construction where other materials are involved.

Facing a simplistic and uncritical culture of the mimesis one might ask: What is the last stage of a construction? Or, what is the original state of a construction that has undergone modifications for centuries? Accepting the sweetish appearance of buildings as the pretext to assess their quality also involves considering their material quality dispensable. Therefore, compared to the mere iconicity of vacuous mimesis and the purity of the original material in the selective anastylosis, anti-anastylosis seeks interpretation and not literality. This procedure is intended to give meaning to the words of Viollet-le-Duc in his dictionary chapter on restoration: *"Restoration: the word and the thing itself are modern: to restore a building is not to maintain it, repair it, or rebuild it; it is to reestablish it in a complete state that might never have existed at any given moment." (Viollet le Duc, 1854,14)*

This sense of active intervention that emerges from the previous quote implies miscibility requirement for any languages used in the restoration work as a wisemeasure, far from the soggy *imitatio* that is merely a simplification of the history of the meaning of the works that reach our time. To consolidate Els Solers factory we had an available ratio of 200 € / m2 as contract budget, VAT included. This economic constraint forced a complete redesign of the intervention strategy and a deep inquiry for the advantageous reuse of existing materials, detached or scattered, as a set of tests that would validate the process defined as counter-anastylosis.

The anonymous denizens of the Molinar instinctively observed the laws of the place and developed the precise rules that built the buildings and their surroundings so that the days and hours have rendered architecture an integral part of the natural environment. It is in this latter time prior to oblivion when buildings assume the lesson from the ruins returning to that primitive state of maximum balance of the form and become a lending to the landscape. It could be said that architecture assumes the character of romantic ruin when it finally pays back to the landscape the first loan it needed to be built.

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Figures

-Figures 1 and 2 are from the personal archive of Vicente Vidal Vidal

-Figures 3 to 6 are from the personal archive of Ciro Vidal Climent.

CHAPTER #7.12

ÉDOUARD ANDRÉ AND THE HORTICOLE MAGAZINE. SOME REFLEXIONS ABOUT TWO PARKS IN PARIS: TROCADERO AND MONCEAU

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1. Introduction

Édouard André is an author well known to landscapers, especially among those who trained at the École Nationale Superieure du Paysage de Versailles, where he was the first professor of garden architecture in 1892. His profile could be defined as a landscape[1] architect trained in horticulture and botany.

He began his professional career in Paris at the end of the 19th century as a collaborator with the landscape gardener Barrillet-Descamps who, together with the engineer Alphand, formed Haussmann's team of professionals, responsible for leading the reform of public space (parks and gardens) that transformed Paris at the end of the 19th century (André-Olivier, 2008). Édouard André participated in this great project as Alphand's assistant, collaborating in the remodelling of the Monceau and Bois de Vicennes parks and in the transformation of the gypsum quarries into an elegant picturesque park that was inaugurated in 1867, in the context of the Universal Exhibition. With this work he obtained his first recognition that gave him international visibility (Schoellen, 1998). The success was consolidated with the first prize received in the international competition for the design of Liverpol's large public park, Sefton Park (1867), where André represented the Parisian team. According to Florence André-Olivier[2],

"His landscaping project confirmed the Parisian style then in vogue in France (to which he added the necessary land for the practice of cricket and for equestrian events typical of British style... "(André-Olivier, 2008, p.3)

With this background, his career began to consolidate and in 1886 he founded l'agence André[3], standing out for its long, neat and extensive activity. The works carried out were located in different countries: France (Buttes-Chaumont, Paris, 1867), England (Sefton Park, Liverpool, 1867), Luxembourg (Ceinture vert, 1871), Monaco (Parc du Casino, Monte Carlo, 1881), Netherlands (Parc de Weldam, 1886), and also in Spain (Parc à las Arenas, 1920 and Parc de Neguri[4], 1921-32) giving international visibility to the André agency.

The American landscape architect Fréderic Law Olmsted emerges from Édouard André's trajectory. His presence is significant and he introduces a key to interpreting his designs for parks and gardens. The relationship between the two has been studied by Phillys Andersen (2000) in "Mon chèr ami: l'amitié entre Édouard André, Charles Sprague Sargent et Fréderic Law Olmsted" (Mon chèr ami: l'amitié entre Édouard André, Charles Sprague Sargent et Fréderic Law Olmsted).

[1]In fact, as Schoellen (1998, 5) points out, it should be pointed out that:
"Although he signed all his plans with the title "landscape architect" - a new term at the time to designate professionals in the art of gardens - Édouard André received training in horticulture first with his father in Bourges and then in the Leroy nurseries in Angers. From 1859 he continued his training with some botany courses at the Museum of Natural History in Paris."

[2]Florence André-Olivier is the granddaughter of Édouard André

[3]From 1890, René Édouard André, hijo of Édouard André will be partner of the agency André

[4]2008. Édouard André (1840-1911) and the society of his time. [papel]. 2008. Doctoral thesis under the supervision of Professor Daniel Rabreau. UFR in History of Art History at the Ledoux Centre. Paris-I-Panthéon-Sorbonne.
Édouard André's work in Spain has not yet been verified. The research is being carried out by Professor Maite Palomares (ETSA/UPV). In 2016 Stephanie de Courtoise's thesis was consulted and deposited in the ENSP library. Annex III (Projects et realizations de l'agence André par localization) of Volume III (Bibliographie, sources archivistiques et documents) documents the list of works carried out by the André office. On page 168 two parks located in Bilbao are cited. On the other hand, page 68 of document 4 of the same volume (Inventaire sommaire du fonds de l'association Édouard André) quotes a plan for the villa of M. le Marquis de Olaso, located in Neguri, Las Arenas, Spain, dated 1929, indicating that it is an improved proposal; supposedly for the aforementioned park in Neguri.

It is an investigation that links the three characters from the correspondence between Édouard André and the also botanist Charles Sprague Sargent, first director of the Arboretum Arnold of Harvard (1872), a work by Olmsted. The link with Sprague, founder-director of the journal Garden and Forest (1888-1897) is also notorious and reveals the profile of Édouard André, the journal was an important publication on landscape at the end of the 19th century in which André wrote articles on French subjects. Andersen points out that the three figures' interest in the picturesque landscape was their nexus: Olmsted incorporated it into American public and private parks, and Sargent considered this landscape to be ideal. Both found in Éduard André a figure close to their interests who, from France, had developed a composite style for the design of parks and gardens, combining picturesque design with the French gardening tradition.

2. The magazines Horticole and L'Illustration Horticole

Edouard André became an outstanding landscaper whose botanical and horticultural training determined his career, encouraging his interest in traveling and exploring equatorial America between 1875 and 1876, in search of new species to work with. Schoellen indicates that:

"Travelling through the forest of tree ferns in the Páramo de San Fortunato, the natural bridge over the gorges of Iconenzo, the giant marshes of La Concha and Mount Chimborazo, he compiled a herbarium of 4,300 species, 3600 new species, 181 vegetable samples preserved in alcohol, 1,108 animals prepared for naturalization, 3,192 insects (992 butterflies), 78 molluscs, 166 minerals and fossils, 166 ethnographic objects, 350 drawings,watercolours or photographs and 7 volumes of travel notebooks! This rich booty was only made known in detail in the magazine Horticole over twenty years."(Schoellen, 1998, p.7.

Between 1882 and 1906, Édouard André was editor-in-chief of the prestigious magazine Horticole. The experience acquired in the magazine l'Illustration Horticole, also as editor-in-chief (1870-1882) was very convincing for his choice. L'Illustration Horticole was a monthly magazine on botany and horticulture, founded in Ghent by Ambroise Verschaffelt and Jean Linden. It specialised in greenhouses and gardens and included information on exotic ornamental plants, which it documented by describing their characteristics, image and explaining their origins. It was published between 1854 and 1896 in Brussels, under the direction of French botanist Charles Antoine Lemaire, until 1870. From then until 1882, the new director was Édouard André. Some of Europe's best botanical artists published full-page illustrations. It is interesting to note that the magazine featured news about botanical expeditions and the communication of results. These initiatives found their way into Édouard André who, as has been commented, travelled through the Ecuadorian jungle between 1875 and 1876.

In 2013 the exhibition Botanical Art of the Sonoran Desert was held at the Ironwood Gallery, Desert Museum. In the section dedicated to periodicals on botany and horticulture, L'Illustration Horticole was highlighted as a reference among European ones for "the golden age of botanical illustration" despite the fact that, in this matter, the importance of English publications predominated.

Following his experience in the Belgian magazine, Édouard André was appointed editor-in-chief of Horticole (1882) together with A. Carriere. It was a French botanical publication in which André had previously collaborated while directing L'Illustration Horticole. It was published bimonthly, from 1829 to 1974, by the Société nationale d'horticulture de France (SNHF). The founders, Antoine Poiteau and André de Vilmorin, had previously been editors of the almanac Bon Jardinier, published between 1755 and 1914, in which Édouard André had also participated. André's contribution to Horticole lasted until 1906 when, for health reasons, he had to stop. In the volume of 1872, the collaboration of Édouard André as associate editor was announced.

Together with Carrière they presented the new strategy of the magazine, taking special

interest in the revision of foreign horticulture in order to increase the French presence in new themes. Thus, the Oranger region in the French Mediterranean took centre stage in the magazine, due to the different horticultural production compared to the rest of the country. The directors requested the generous collaboration of new correspondents who would provide information, mainly on the particularities, evolution and production of these crops. In addition to showing the targets, the new directors also stated their intention to increase the number of pages of text (four more) by maintaining the number of color images (24 per year).

It could be said that both Horticole magazine and L'Illustration Horticole already stood out for the quantity and quality of the coloured engravings. With regard to the black and white reproductions, they considered that it was necessary to enlarge the number, pointing out that they wished to include plans of gardens and examples of ornamentation, in addition to the usual plant drawings[5]. These new decisions, already in the first issue of 1882, evidenced Édouard André's co-direction in the journal. When he left office in 1906, the magazine echoed the news in the first pages of the January 1907 volume.

3. Édouard André and the Horticole magazine: the Trocadero Garden and the Monceau Park

During his time as editor of the magazine Horticole, Édouard André developed an intense activity, collected by an immense number of articles published over twenty-four years. Despite their diverse content, they can be organised under three main headings: Horticulture, Gardens and greenhouses and Miscellaneous, a classification used in some issues of the journal. The frequency of his writings has been reduced in recent years to an annual contribution. Among his texts, those dealing with horticulture were the most numerous, logically because the magazine focused on botanical and horticultural issues. However, articles on parks and gardens were also quite frequent, and twenty-eight were published as an indication in the first volume. Among them, Édouard André's interest in showing the public parks of Paris was evident. During his editorial project he studied fragments of some important Paris parks such as Trocadero or Monceau.

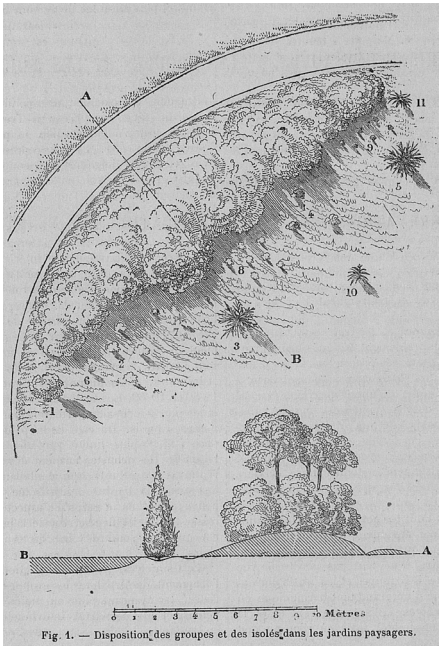
3.1. Trocadero Gardens

Édouard André had a special interest in the gardens of Trocadero to which he dedicated four articles. Two were published in the 1882 and 1883 volumes and two more were published later, in 1889. They were four autonomous stories, with different perspectives, although we could bring them together in two groups.

The first analysed fragments of the Trocadero garden from the point of view of landscape treatment, while those of 1889 referred to two areas of the universal exhibition located in the Trocadero garden: the Cannas by A. M. Crozy and the Japanese Garden by M. Kasawara. In his initial texts, Édouard André was interested in medium-size public parks in Paris, choosing the Trocadero, designed by Alphand[6]. His narrations had a pedagogical accent, apparently characteristic of André as Schoellen interprets it: *"He was constantly concerned with educating the public with his numerous articles published in the magazine Horticole"*. (Schoellen, 1998,7). To this end, the texts were accompanied by drawings of the plant and section of the garden, indicating the exact arrangement of the plant matter as well as a detailed description. As a complement, a legend was attached specifying both the species of the grove and those arranged in isolation, simulating spontaneity, when in reality everything was studied, avoiding alignments and voids, to create a desired effect. Even the cuttings and fillings were preset. The same thing happened with the size, color and expiration of the leaves of the bushes that adorned the edges of the road, with the grass and with the height of the strips of grass. Although the two texts have a similar structure, each of them focused on a different area of the garden; the edge of a path and a crossroads, both resolved from the contrast and combination of varied species but maintaining harmony.

[5]In the text, editors emphasized that the subscription price would be maintained even if the quality of the magazine improved thanks to the improvements implemented.

[6]As is well known, Alphand was responsible for the design of the outdoor spaces for the 1889 Universal Exhibition.



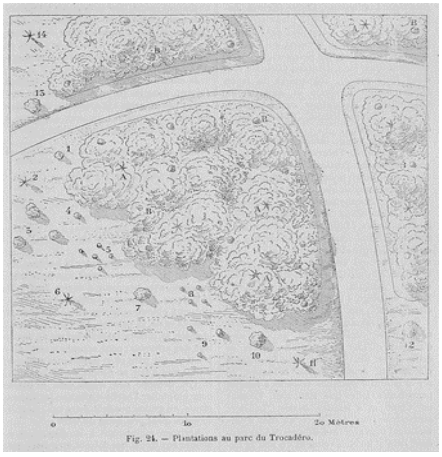


Figure 1. a_Layout of woodland on an edge of the Tocadéro gardens. Revue Horticole (1882).
b_Woodland layout at a crossroads of the Tocadéro gardens. Revue Horticole (1883).

The last texts, both from 1889, analysed two areas of the Trocadero garden dedicated to the 1889 universal exhibition, in commemoration of the centenary of the French Revolution. However, the two cases were very different. At the Cannas plantation of Antoine Marie Crozy, a prestigious gardener, André referred to research carried out on species exogenous to French culture. The French gardeners had managed to incorporate them into the horticultural tradition, with great work and effort, and had obtained new results, of great beauty. The article collected the opinions of personalities such as President Carnot, Albert Saint Hilaries, Antoine Chantin, among others. They all agreed on Crozy's achievements.

The last of the articles showed Édouard André's interest in the Japanese garden installed next to the Tocadero palace. This was an opportunity to get to know Japanese horticulture directly, and André took the opportunity to connect with Japanism, which became increasingly influential at the end of the 19th century. In addition to documenting horticultural issues, the text also analysed the atmosphere created in the enclosure built for the occasion. In the first place, he paid attention to the delimitation made with vegetable matter, some bamboo canes. Inside it contained a garden and a pavilion where tea was served in a particular environment adorned with garlands made from rice husks. Regarding vegetation, bonsai were the main theme of Japanese garden art. André called them "*dwarf trees*" that reflected the spirit of Japanese culture, for whom tiny meant perfection. The choice of this garden showed André's attention for its novelty, since the taste for bonsai was not very widespread in France at that time.

3.2. Monceau Park

Édouard André put his interest in another park designed by Alphand[7] to which he dedicated three articles. He defined it as "the most elegant

[7]Rancine, M.(2004). *Jardines en Francia*. Paris: Actes du Sud
Monceau Park was originally a private park owned by the Duke of Chartres who, in 1783, commissioned Thomas Blainikie to design it on the basis of the ideas of the landscape painter Louis Carmontelle. The picturesque garden contained constructions, replicas of architectures from other cultures: pagoda, pyramid, temple, castle...
In 1852, the French state acquired part of the park and the rest was transformed into private residences with a close relationship to the park. Jean Charles Alphand was responsible for the remodelling of the publicly owned land. The result is the image currently shown in the park.

in Paris, always preferred by the city gardeners". Two texts were published in 1882 and the third in 1887. The first were part of André's pedagogical tendency and it was with this perspective that the park was analysed, highlighting various aspects. The first studied an area of the park adjacent to Van-Dyck Avenue and analysed the isolated arrangement of trees on the edges of a large lawn area situated in a landscaped park. The author concluded that such a layout would not have been acceptable in a park with a regular and symmetrical layout; the text was accompanied by an explanatory plant indicating the position and type of vegetation.

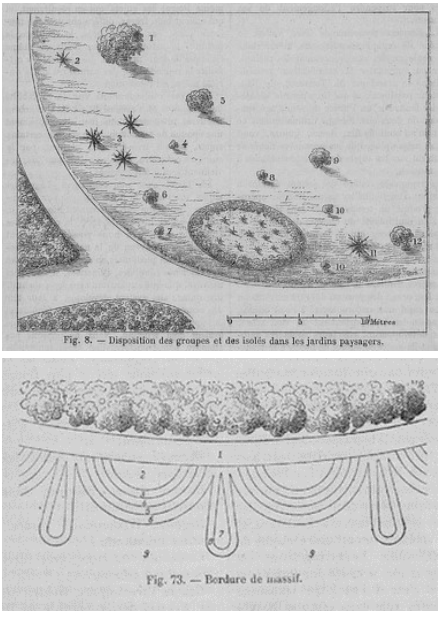


Figure 2. a_Detail of the trees arranged in isolation on a path of the Monceau Park. Revue Horticole (1882). b-Detail of an edge of the Monceau Park. Revue Horticole (1889).

The second text simulated a walk through the park in the middle of the summer, when everything was flourishing. According to André it was the best time for an instructive visit to the garden. Among such beauty, the particular layout of the edge of the park on a bend in the path stood out. In the shape of a festoon, it was composed of large semicircular waves that alternated with cabochons. Its effect was relevant because of the contrasting colours and smaller size compared to the uniformity of the trees on the other side of the road. It was accompanied by a drawing of the plant detailing the vegetation as well as a precise legend with the plant species.

The last text on the Monceau park took a different turn. André presented the park as *"a model of French taste for the composition of an urban park and its floral decoration" and also as "one of the best walks you can take around the city"*. At the same time he pointed out, with a certain critical nuance, some points that could be improved, however, he indicated that they were aspects of little importance despite the fact that they referred to botanical issues in which he was an expert. He focused on the fact that the abundant presence of shrubs and plants on the lawn surface was inappropriate because it impaired the overall perception of the green carpet.

4. Conclusion

Édouard André's work in the journal Horticole was intense and is documented in numerous articles published between 1882 and 1906, when he was associate editor. Some of them, most abundantly, dealt with botany and horticulture, a subject in which André was an expert because of the training he received. He also published other texts on the public parks and gardens of Paris, a subject related to his professional career initiated with Barillet-Descamps and Alphand, when they worked on the important transformations of the public space and gardens of the city.

The gardens of Trocadero and Parc Monceau, two important public parks in Paris, were well represented in André's articles for the magazine Horticole. Their analyses combine the double training received: a landscape architect trained in botany and horticulture. Thus, the articles on the public gardens analysed in the text combine both interests, making it possible to appreciate Alphand's stele, which places him in the circle of Olmsted, and his links with the French gardening tradition.

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CHAPTER #7.13

THE ILLUMINATION OF ARCHITECTURAL HERITAGE: PARTICULAR CASES OF STUDY

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1. Introduction

Large and small buildings of very different architectural styles have been erected over time in unusual locations as a narrow street, a dark place surrounded by trees, a waterfall ... The games of light and shadow have brought ornamentation to this architecture. Until the incorporation of electricity into our lives only the solar lighting allowed to contemplate any type of architectural construction, its elements in height and, logically, only during a limited period by sunrise and sunset, which according to the location and the season of the year was variable. The advances in transport and investment in a growing tourism have allowed the boom of this industry that has relapsed favorably on the heritage. A new type of night routes has been generated for which lighting is essential. Equipment, luminaires and installation are important, however, not enough without the support of a good design and the correct choice of lamps.

The line of research shown in this paper combines design, choice of equipment and calculation of lamps as well as preview of the result through virtual images that corroborate the suitability of the study.

2. Scope of study

Every building has the right to be admired, although, logically, the budgets that are used for it go more to the great works, above all, of public character and property. However, the research that we are looking for has sought more singular architectures, unknown, or unvalued as the case of excavated architecture and industrial architecture. A proper use and treatments of the spaces by artificial light allows the creation of different scenes from the same area.

In the case of the excavated architecture, different uses are contemplated, from residential (Figure 1), to a winery, which are the most common, and a reuse offering a service as a museum. An extensive study of industrial brick chimneys has been carried out throughout the Spanish geography (Figure 2) with lighting installation (Figure 3) and also a rice syndicate.

Figure 1. View of caves in Huéscar (Granada). Credits: Gracia López.

3. Objectives of the research

The first objective of the research is the characterization and analysis of the systems used in the different building typologies, that is, analysis of reality, with its successes and fails, and then to establish optimal lighting parameters to improve nighttime visualization and lighting. in value of the architectural elements studied, transferring the current lighting trends of the studied architecture and adapting the systematics and methodology to a project proposal.

Figure 2. Espinosa winery chimney (Tomelloso). Credits: Gracia López.

Figure 3. Antonio Fábregas winery chimney lighting (Tomelloso). Credits: Gracia López.

4. Methodology

The method used is based on the study of cases, attending on the one hand to the morphology and characteristics of the building element and, on the other, to the lighting systems and elements. A HIBOX - 20 luxometer was used to study the lighting.

The conclusions obtained from this phase will help detect the successes and errors of the systems used and will be the basis for the new design and choice of lamps of the different commercial brands that exist in the market (Figure 4).

Finally, a calculation method is chosen to check the efficiency of that lamp and its discarding if necessary. The methods used are the lumen method or zonal cavity method and the point by point method. With these parameters, highly effective digital images are made to contemplate a virtual reality (Figure 5).

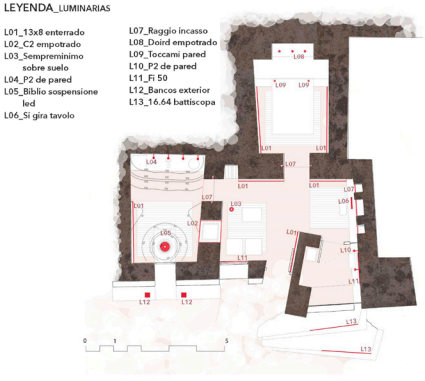

Figure 4. Plan of the cave with lighting distribution. Credits: Salvador Silvestre.

Figure 5. Indoor lighting of a cave. Credits: Salvador Silvestre.

5. Case study: excavated architecture

The cave for the study corresponds to the one worked by a team of the ETSA Valencia that obtained in 2015 the third prize of the award Project housing cave-La Herradura organized by the City Council of Huéscar, in the province of Granada. This cave presents an unbeatable location, dialoguing face to face with the population and presenting its best views in front of it.

It is a cave composed of three rooms, bedroom, kitchen and living room with a fireplace that perfectly preserves both the hood and the draft for the expulsion of smoke, which can be seen from the cave's roof. A door framed by thick stone walls gives access to the interior.

The specific goal is to transfer the current lighting trends to the excavated architecture, adapting the systematics and methodology, to a project developed in a set of cave dwellings with a possible hotel use.

The lighting selection process has been thorough and very detailed, and various factors, both aesthetic and technical, have been taken into account. Finally, a total of fifteen luminaries have been chosen that advocate a minimalist design with the intention of not overloading the space of the rooms. Some technical sheets (Figure 6) have been designed for the different lamps and luminaires chosen, after the calculations, for each area where their characteristics are gathered, technical data, installation details in the hotel and images.

In outdoor environments the process of choosing the luminaires has been more complicated, due to the complexity involved in outdoor lighting. Aspects such as the angle of inclination of the luminaire with respect to the ground or the degree of focal aperture of the lamp have been taken into account, with the aim of causing a light pollution that is nil or practically negligible.

Likewise, the installed power and the energy efficiency value of the installation (VEEI) were verified, comparing the results obtained from the calculation, with the values established in the Technical Building Code section DB HE-3.

It is concluded that the latest lighting trends are positive for the excavated architecture, as it allows us to revalue their constructive characteristics, textures or create new environments combining ancient techniques to inhabit and the current way of inhabiting them.

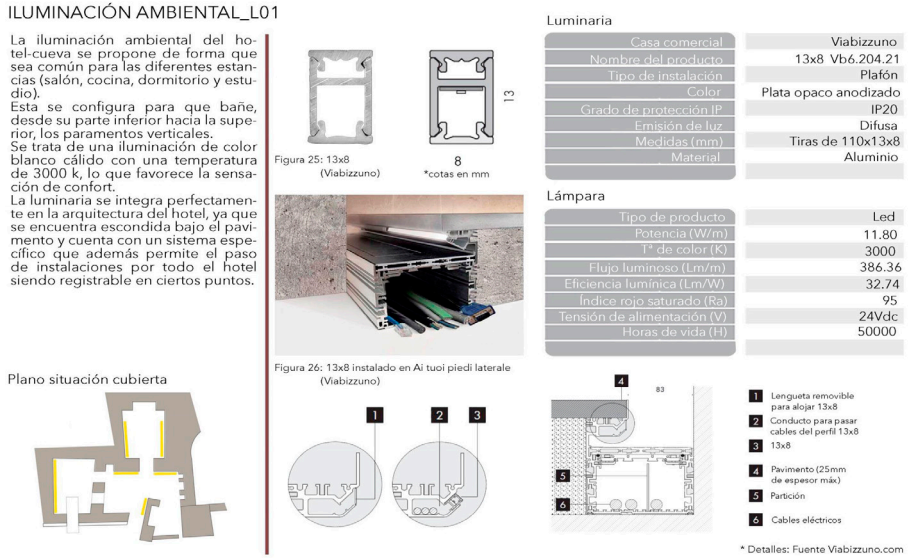

Figure 6. Form sheet of environmental illumination. Credits: Salvador Silvestre.

6. Case study: Industrial chimneys of brick masonry

In the case of industrial brick chimneys, which are hollow vertical elements through which smoke was expelled at high altitude, the objective of specific study was the characterization and analysis of the lighting systems used, according to area, section and height of the different chimneys, and the establishment of optimal lighting parameters to improve night viewing and the enhancement of these industrial elements in height. Although there are not many illuminated chimneys, up to 24 study units have been found in the east, south and center of Spanish territory.
The lighting of brick chimneys is directly hindered by the total height of the element, the coloring of the brick, the ornamental diversity in the different parts of it and, above all, the size of the base.
With three different visual parts, base, shaft and crown, in the cornices of the bases the diversity of arrangement gives rise to a greater ornamental variety on a human scale, however, the ornamental details that could exist in the shaft and the crown are also important, to be seen even from a distance.
Technical specifications have been drawn up specifying the constructive and dimensional characteristics of the chimney and the data of the installed lighting system, specifying the types of luminaires and equipment used, the location, number of them and their distribution, as well as the parts that illuminate. Regarding the projectors used, there is a distinction between adjustable ones that are fixed on the top of the base or on the start of the shaft and embedded in the ground. The type of equipment is divided into electromagnetic or remote control. As regards light points, the quantity varies between four or eight elements
The results are related problems, firstly, with the integrity of the chimney since 87.5% of the studied specimens have undergone a series of perforations with screws that serve as anchorage for the installed adjustable projectors. In addition, 82.75% of these projectors are located in the upper part of the top of the base of the chimneys and leave it in a second plane, focusing only on the shaft and the crown of the chimneys. The installations embedded in the ground affect the space that surrounds them with important light pollution since they can not be oriented towards the element but towards the sky.
In most cases (91.66%) a system of luminaires located in the lower parts of the industrial chimney is used, which does not show the totality of the chimneys but only the lower third of the chimney. With this, the actual volume, the ornamentation of each of the parts and the protrusions of the bricks disappear at nightfall. For those places where there is more than one light system (8.34%), as in all cases located in Catalonia, in addition to supporting a light saturation, the system does not help the perception of the chimney but makes it difficult.

7. Conclusions

After the case studies, the following conclusions, that affect not only the architectural element but also the immediate surroundings, are observed:
The integrity of the studied building suffers a series of injuries due to the weight and anchorage of installed projectors and lamps. Some elements, given their height, the incorrect power of the lamp, the incorrect position of this lamp, remain without lighting, creating strong shadows in different parts. Sometimes the jet of light is so intense that you can not appreciate the details.
Many times light pollution is generated which affects the space that surrounds the building
The maintenance of the equipments in public spaces whose property is municipal like chimneys is unfortunatetly poor.
New trends in illumination are clearly favorable to an earthern excavated architecture to show details of texture and special elements of this architecture, creating new environments between day and night, action or relaxing times.
A new direction to this research is to find new cases of these architectures to study.

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CHAPTER #7.14

CREATING A RESIDENTIAL BUILDING DATABASE: SOURCES, CONTENTS AND RELIABILITY

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1. Introduction

The enhancement of the current contents of existing databases of buildings located in old city centres, including extended information about: construction materials, structural systems, technical documentation of the original project (when possible), and subsequent interventions; is particularly convenient for many purposes. Among others, it is well known that an extended building database is an essential tool to address large-scale studies such as municipal rehabilitation campaigns (facades and roofs, energy efficiency, architectural barriers), vulnerability analysis and evacuation plans in case of floods or earthquakes.

2. Case Study: Valencia's historic centre

Research activities of the authors required them to manage large amounts of information about the built heritage in Valencia's historic centre. To fulfil this requirement, a geo-referenced database of the building stock of the 1st district of this city was designed. Starting from the cadastral database, the following data for each building can be obtained: geometrical properties, number of floors, uses, age, and location on the map, it is essential to enhance this information adding technical data about original and current construction details and procedures (highly relevant to design energy retrofitting proposals) (Perez-Garcia, et al. 2018) plus structural system description and details (essential to evaluate the earthquake-resistance and the seismic response of the structure of each building) (Guardiola-Víllora & Basset-Salom, 2015).
In this paper the authors share the gained experience regarding the retrieval of information about the structural system of a sample of buildings when consulting several usual and supposedly reliable, databases. Among others it has been consulted the Catalogue of listed buildings created by the City Council of Valencia (Ayuntamiento Valencia, 2014 and 2018), the archive of the Architectural Information Centre (CIA) of the School of Architecture of Valencia (ETSA), the Municipal Historic Archive of Valencia (AHCV), the Architecture Guide of the Chartered Association of Valencian Architects (CTAV) (VV.AA. 2014), the Registry of Architecture of the XXth century in the Valencian Community (VV.AA. 2002), and the Iberian DOCOMOMO (Docomomo, 1996). Additionally, some other less conventional sources of information have also been checked: private and public Architecture blogs or Google Street View. Finally, results from on-site visits have also been required because they have proved to be the most reliable source. Buildings included in the sample should supposedly be well documented because they are well known in the city and they are not too old. Figure 1 shows their location in the map.

2.1. Catalogues of Listed Buildings

Several protection plans such as PEPRIs (Ayuntamiento Valencia, 1992), PEP-EBIC (Ayuntamiento Valencia, 2014), and PEP (Ayuntamiento Valencia, 2018), (the last one under public display period) are focused on District 1 "Ciutat Vella", being the catalogue of listed buildings one of their documents.

B1-Pl. Ayuntamiento B3-C/ de las Barcas
B2-Av. Mª Cristina & C/ San Vicente B4-Av. del Oeste & C/ Adresadors

Figure 1. Location of the sample of buildings retrieved.

Figure 2a shows a database record from the PEP-EBIC protection catalogue. It references the building B1 and it includes the cadastral reference, the plot area, the number of floors and age and, although unusual, the name of the architect, offering, sometimes, the possibility of finding more information. According to the catalogue, the horizontal and vertical structure is composed of reinforced concrete rigid frames. Attending to the year of construction, this information could be accurate, since it is assumed that the first building in the city of Valencia that was built using a reinforced concrete structure was the "Carbajosa building" (1929). The information about the construction of the roof and facades is scarce and only the compositional aspects of the building have been recorded. Figure 2b presents the information that can be found in PEP's catalogue related to the same building. Data about the structural system are similar but in this case it is explicitly mentioned the age of the building as the data source. Finally, it was considered essential to contrast this information against records provided by the Cadastral database. Figure 2c shows the cadastral database record of this building where the shape of the plot and the number of storeys are in agreement with the previous databases. Although the reference year of construction differs in one year the information can be accepted as valid.

However, it is not usual to find in these catalogues information about the structural system. As an example, in the record of the building B2 (residential building located at the corner of Mª Cristina Avenue and San Vicente street) obtained from the PEP-EBIC catalogue (Figure 3a,b,c) there is no information (or just mere assumptions) about the structure of such a singular building.

2.2. Architectural Information Centre of the School of Architecture of Valencia

The Architectural Information Centre (CIA) of the ETSA houses archives of some relevant architects, among others, the archive of the architect Joaquín Rieta Sister (Figure 4a, 4b and 4f). These archives can be accessed on-line and hundreds of digitalized documents can be easily searched by means of word sequences or using keywords.

Retrieving the 714 records of this institutional repository, the structural plans of the building of Joaquín Rieta tagged as B3 (Figure 1) can be found under the header "Structure plan of the commercial ground-floor of the Gil Adán Building of the Plaza del Caudillo and Calle San Vicente, 1944." (Figure 4b). One of the documents, signed by the architect in December 1944, is the layout of the structure of the basement floor of a corner building. The drawing shows that this floor was intended to be built using frames of steel beams and columns.

Knowing that in 1979 the "Plaza del Caudillo" changed its name to "Plaza del Ayuntamiento", the search of building B3 in the cadastral database should be done using the last address: building located at the corner of "San Vicente" and "Plaza del Ayuntamiento". The retrieved record has been marked with a red arrow in Figure 4d and it is evident that the structure layout obtained from the ETSA's repository does not correspond to building B3 (Figure 4e). Therefore, we have a structural plan, being the building to which it corresponds unknown. Finally, checking carefully the metadata of the drawing (document shown in Figure 4c) can be confirmed that it corresponds to a building located in "Calle de las Barcas" (Figure 4f). A new request in the ETSA repository using the new location retrieves new structure plans (Figure 4i) that are consistent with the previous one and revealing that in 1947 two floors were added to the building and steel structure was also used.

2.3. Municipal Historic Archive of Valencia

The visit to the Municipal Historical Archive of Valencia (AHMV), located at Cervelló palace, is always the last resort because there is no digitalized version of the stored documents and archive boxes must be requested, one by one, in order to review the projects contained in each one. Taking into account the short gap of opening hours, this is a highly time-consuming source of information. Moreover, the expectancy of obtaining useful results is usually low. After many visits to the AHMV, information about building B2 was unsuccessfully searched. Nevertheless, the project of building B1 was encountered and reviewed. The layouts and elevation plans (Figures 5a and 5b respectively) were useful complementary information. However, the constructive report (Figure 5c) described the structure as beams and columns

made of hot rolled steel and this data were inconsistent with the Catalogues of listed buildings that reported a structural system composed of reinforced concrete frames. Moreover, a project of a building in "Adresadors" (also within the study area) was found (Figure 6a). The structure seems to be load-bearing walls and circular columns but it was not possible to deduce the structural material from the graphical information. It was necessary to review the constructive report to find out that all columns and beams were intended to be made of iron (Figure 6b). With the help of the location plan (Figure 6c) and taking into account several changes of street's name, consequence of the opening of the new street called "Avenida del Oeste", the building, tagged as B4 in Figure 1, was finally located on plot 01 of block 55252 (Figure 6d) of the Cadastre (2018). This is a clear example of no georeferenced information.

Figure 2. Data records of building B1. Source: a) PEP-EBIC (2014), b) PEP (2018), c) Cadastre (2018).

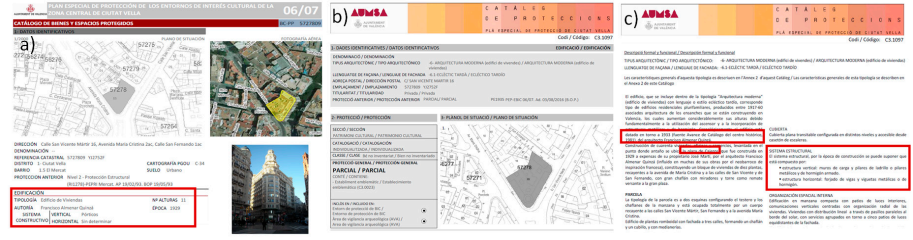

Figure 3. Data records of building B2. Source: a) PEP-EBIC (2014), b) c) PEP (2018).

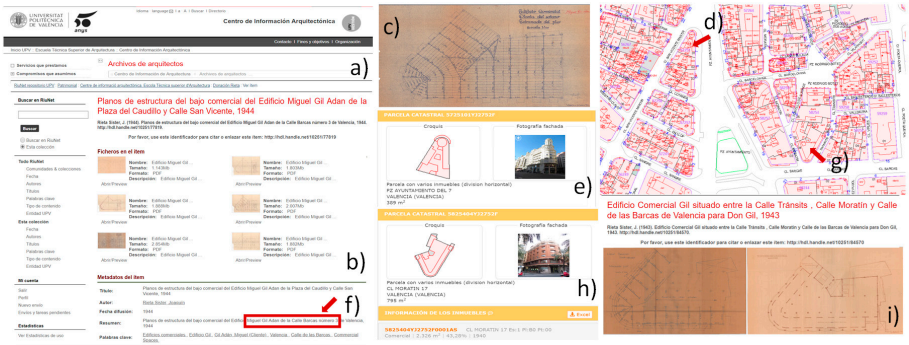

Figure 4. Data records of building B3. Source: a) b) f) CIA Archive, c) Joaquín Rieta archive (1944), d) e) g) h) Cadastre (2018), i) Joaquín Rieta archive (1943).

2.4. Other institutional sources

Structural information has been searched in the Valencia's Architecture Guide, in the Iberian DOCOMOMO database, and in the Registry of Architecture of the XXth century in the Valencian Community. Nonetheless, the information included in all three sources basically refers to layout and the facade compositions, making reference to the structural elements only in very specific cases.

2.5. Google Street View, architecture blogs, real state agencies and other private sources

Nowadays, the Internet is a very powerful tool when looking for information, provided that you know what concepts to search and you are lucky with "t*he words you Google*". Sometimes it is enough to write an address and information from a real estate agency appears (Figure 7a). Some others you can unexpectedly find in Google Street View the inside of a commercial space or a bar, were structural information is revealed (Figure 7b and 7c). Googling "Plaza del Ayuntamiento buildings", we found links to the blog of J. Díez Arnal where a picture shows a building that was under construction (Figure 7d) and another more recent picture (Figure 7e) shows the current appearance of the that building. Surprisingly, the building in these pictures is the building B2, known as "Los Sótanos", and this documents show without any doubt that the structure was made of steel in clear contradiction with the assumptions made in PEP (2018) (Figure 3c).

2.6. On-site visits

Once all the records have been completed and the information about the structure has been obtained, from more or less reliable sources, it is essential to carry out an on-site visit to the buildings that raise doubts either for the year of construction, the number of floors, the external appearance, etc. Sometimes, the structure can be seen in the ground floors, if they have public use (commercial premises, offices ...). In these cases, it is advisable to take a georeferenced picture. Images obtained from authors during on-site visits are shown in Figure 8. Nevertheless, it must be taken into account the existence of misleading "structures" (Figure 8f).

3. Discussion

The number of records in the abovementioned database is circa 3200. Around 2000 are residential buildings and the rest are institutional buildings, commercial or office buildings, ruins or just land plots. The authors have developed a database including information from many sources (some of them have been mentioned in this paper) that refers to all the residential buildings, containing data about their structural system, guaranteeing that at least 50% of the included structural data have been checked (the rest has been inferred from the age). In the compilation process, sources such as: history books of the city, publications on interventions in *"Ciutat Vella"*, research articles, Degree final Theses, Master Theses, and PhD Theses; have also been consulted. However, gathering information about the structural system or the constructive solutions of buildings is a laborious and sometimes unsuccessful task. One of the main reasons is that, traditionally, the specialised literature has only considered relevant aspects like the architectural style or the compositional aspects of layouts and elevations, remaining the more technical issues, related to structure and construction, in the background. Although the size of the sample described in this paper is small, it has been checked that the lack of information or the data inaccuracy related to the stock of residential buildings located in the "*Ciutat Vella*" of Valencia is significative.

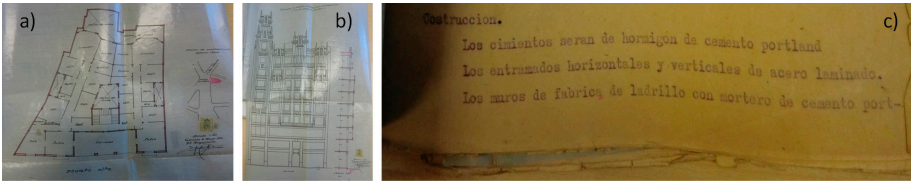

Figure 5. Data records of building B1. Source: a) b) and c) AHMV año 1930 caja 5.

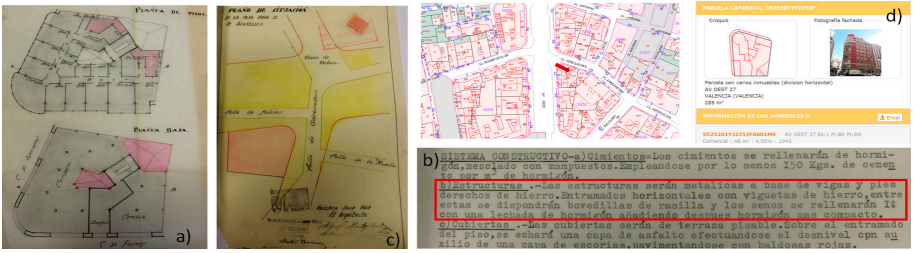

Figure 6. Data records of building B4. Source: a) b) c) AMHV año 1940 caja 1, d) Cadastre (2018).

Figure 7. Images from the Internet. Source: a) b) c) Google Street View, d) e) Building B2 in construction blog of J. Díez Arnal (2018).

Figure 8. Uncovered structural elements. Source: the authors (2017).

4. Conclusions

Considering the results obtained in the study of the structural systems of buildings in the district "Ciutat Vella" of Valencia, a small sample of cases is presented in this paper. The results show that there is a great dispersion of the information related to the technical characteristics of this built heritage, being fundamental to complete, check and gather all data in a single and comprehensive database of public access. This situation seems that will be amended after the publication of decree 53/2018 of April 27, which regulates the creation of an autonomous registry of "Building Evaluation Reports", which have to describe, among others, the constructive characteristics and structural system of each building. These reports, which are compulsory for all listed buildings or for buildings older than 50 years, will complete the existing gaps and will provide coherence to the current listed buildings catalogues of Valencia, namely the PEP (2018).

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CHAPTER #7.15

RESEARCH EXPERIENCES IN COOPERATION AND SUSTAINABLE DEVELOPMENT. THE CASE OF BAASNEERÉ (BURKINA FASO)

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1. Introduction

For over ten years the RES-Arquitectura research group (http://resarquitectura.blogs.upv.es/) from the Institute for Heritage Restoration of Universitat Politècnica de València, directed by Fernando Vegas and Camilla Mileto, has been working on the research, protection, conservation and restoration of earthen architecture. In this time different projects and studies have been carried out in the region including the project REStapia (Restoration of rammed earth architecture in the Iberian Peninsula. Criteria, techniques, results and perspectives [BIA 2010-18921]. Spanish Ministry of Economy and Competitiveness / Ministry of Science and Innovation. 2011-2013. Main Researcher: Camilla Mileto) and the project SOStierra (Restoration and Rehabilitation of traditional earthen architecture in the Iberian Peninsula. Guidelines and tools for a sustainable intervention [BIA2014-55924-R]. Spanish Ministry of Economy and Competitiveness. 2015-2017. Main researchers: Camilla Mileto and Fernando Vegas) within Spain, as well as the European Project VerSus (Lessons from Vernacular Heritage to Sustainable Architecture [grant 2012-2792/001-001 CU7 COOP7]. European Union Culture Programme 2007-2013. 2012-2014 Main researcher: Mariana Correia). Thanks to their activity within this field of research Camilla Mileto and Fernando Vegas were appointed as representatives in Spain for the *UNESCO Chair in earthen architecture, building cultures and sustainable development* in 2012. More recently, as a result of their research projects a new line of work has opened up which has allowed them to move from theoretical research to action-based research within cooperation projects. It is within this context that the ConBURKINA Project was born, initially aiming to combine research tasks with cooperation and contributions to sustainable development.

2. Earthen architecture as cultural heritage and an example of sustainability

2.1. Traditional earthen architecture

Like other types of vernacular architecture, earthen architecture is based on the three pillars of sustainability: respect for the environment (adaptation to the ecosystem, adaptation to bioclimatic conditions, reduction of transport and pollution, etc.); sociocultural development (conservation of the landscape, transmission of traditional constructive knowledge, development of social relationships, etc.) and socioeconomic development (promotion of local autonomy and activity, durability of constructions, savings in resources, etc.). Earthen architecture is born from local materials (earth, straw, reeds, wood, etc.), and over centuries has adapted to local climate, optimising energy and bioclimatic resources. The construction of this architecture using local techniques and materials executed by local artisans has resulted in savings of transport and resources, as well as the development of local economy. From the second half of the 20th century, traditional architecture, including earthen architecture, has been progressively abandoned and/or rehabilitated with major transformations resulting from great urban development, as well as the presence of the construction industry and the use of industrial materials.

2.2. Research on traditional earthen architecture as a pathway towards sustainable architecture

The aim of compatible and sustainable restoration and rehabilitation of this architecture has now become a priority in the conservation of a common cultural heritage and a real pathway to be followed towards a more sustainable development, in keeping with the proposals of the European Commission (Horizon 2020 - Sustainable Development and Natural Resources). The restoration of traditional heritage constitutes a major contribution to the social development necessary for the construction of civic values, through learning local culture and its relationship with the environments and adaptation to surroundings as well as to the traditions and customs associated with the territory. In addition, the use of traditional materials and techniques makes it possible to valorise artisanal work and technical skill as a foundation for a better adaptation to the bioclimate conditions of the setting. In this regard, restoration is a possible driving force for local economic development through the use of local materials, artisans and businesses. Activity linked to the restoration of traditional architecture encourages local employment and boosts small and medium business economy. The restoration of heritage also leads to improvements in the territory which contribute to cultural tourism, and in turn, local economy.
In addition, the rehabilitation of dwellings is currently a key challenge in both Spain (as stated in Law 8/2013) and Europe if the goals proposed for 2020 in terms of energy saving and fighting climate change are to be reached. The use of local materials and traditional artisanal techniques results in major energy savings in production and even a major reduction in gas emission from the transport of materials. Learning about and recovering technical and morphological solutions of buildings that are perfectly adapted to the bioclimatic setting is also a major step towards energy saving.

2.3. Earthen architecture and cooperation

After the completion of these research projects which have provided major scientific reports in the field of earthen architecture and a solid work methodology, an opportunity arose to apply the knowledge acquired to the new contemporary architecture in the context of cooperation. As earthen architecture is indispensable in the constructive tradition of much of Africa, taking part in African projects seemed a logical next step in the work carried out following these lines of research which began over a decade ago.

3. Research methodology

Following the different studies carried out on earthen architecture, its conservation and lessons for sustainable development, a common work methodology was gradually consolidated in order to execute these research projects with the necessary scientific rigour. This research methodology was also developed in the studies which were originally based on projects such as doctoral theses or masters' dissertations.
In general, the methodology for these research studies consists in cataloguing, analysing and reflecting on earthen monumental and vernacular buildings, constructive techniques, lesions, and intervention dynamics and actions. This research is carried out through case study analysis (the number of case studies may vary depending on the scope of the research) following a qualitative method based on extensive information from different primary sources (interviews and information provided directly by the agents involved in the building) , secondary sources (other possible sources of information), direct sources (the buildings) and indirect sources (bibliography, archive documentation, project documentation, etc.) (Mileto et al. 2012; Mileto et al. 2018). The main aim of this type of research, other than knowledge of building traditions, is the proposal of guidelines for the conservation, restoration and rehabilitation of this type of architecture.
The methodology proposed consists of three basic phases: 1. Information collection (creation of a case study database that is as complete as possible; selection of case studies of further interest; selection of cases for further study; 2. Analysis of cases for further study, reflection and joint discussion of experiences

(analysis and assessment of cases using a crossdisciplinary methodology); 3. Production of a body of knowledge and dissemination (as a final phase of the methodology work has been carried out individually on all projects through the organisation of different seminars; as well as through drafting different scientific studies which, along with other dissemination activities such as different exhibitions and webpages, have allowed the results of the projects to be disseminated and implemented within the framework of the scientific community).

4. Burkina Faso. Geography and society

Located in the centre of the high plateau of East Africa, Burkina Faso has the lowest index of human development in the world (UNDP, 2016). Despite its rich mineral resources, it is estimated that 55% of its 18 million inhabitants live on less than 1.90 USD a day (UNICEF, 2016). Life expectancy is 59 years and child mortality rates are 6.1% in the first year and 8.9% in the first five years (UNICEF, 2016). Despite this the average fertility rate of 5.5 children per woman ensures a 3% annual population growth in the country (UN/DESA, 2017).

Burkina Faso has a tropical savannah climate with seasonal showers. The climate is arid in the north of the country, with its mostly savannah landscape, scattered with trees and bushes. The dry *harmattan* wind from the Sahara blows between November and February, carrying large amounts of dust, while the temperatures are highest from March to June. The rainy season is between July and September, with rainfalls ranging from 100 cm per year in the south of the country to 25 cm per year in the north, which is part of Sahel (MAEC, 2018).

In recent years, the north of the country has become increasingly unsafe due to the growing threat of extremist groups from Mali and Niger. Furthermore, the chronic drought has - in this part of Burkina Faso alone - resulted in approximately 78,400 people being classed within phase 3 of nutrition insecurity (UNICEF, 2017), characterised by a critical lack of access to food and high levels of malnutrition (FAO, 2009). These circumstances, along with prolonged teachers' strikes, have deprived 97,000 children in the region from the right to a continuous education throughout 2017 (UNICEF, 2017).

5. Algemesí Solidari and the school in Baasneeré

Baasneeré is a village with approximately 2,308 inhabitants (2012) in the province of Sanmantenga, in an area between the Sahel region in the north of the country and the central mountain ranges in which the country's capital Ouagadougou is located. Baasneeré is located halfway between the cities of Kaya (54,365 inhabitants) and Kongoussi (25,172 inhabitants) and as a result it has become the centre of economic activity in the region, with a busy market which is held every three days. However, the poor conditions of the 25 km of dirt road which separate it from the closest city and the limited access to individual and collective means of transport complicate residents' access to the services which they cannot find locally.

Since 2009, Valencian NGO Algemesí Solidari has been in close permanent contact with the local association Buud-Bumbu de Bao/ Baasneeré *(A3B)*. This relationship has led to the development of several projects focused on working with local children and the renovation and improvement of local facilities. To date a well has been built, the maternity building renovated, and several campaigns for supplying medication to the medical dispensary have taken place.

Baasneré has several primary schools with ratios of around sixty pupils per classroom which manage to cover the early schooling of most of the local children. However, there are no secondary schools nearby and local youths are required to travel 30 km to the nearest one. This difficult communication with secondary schools and the limited economic resources of most families have often translated into early school dropout rates, especially among girls.

In view of this in 2013 Algemesí Solidari and A3B embarked on a joint project for the construction of a school in the village. Based on an urban participation process which involved representatives of local society, Algemesí Solidari proposed a project using earth to build

an inexpensive and sustainable building, rooted in local constructive tradition which could be assimilated by the residents of Baasneeré (Maravilla y Ferragud, 2018).

6. ConBurkina

The relationship between the members of the Res-Arquitectura research group and Algemesí Solidari began in February 2014 when specialists from the association took part in a traditional workshop organised at Universitat Politècnica de València. Since then both parties have continued an informal collaboration, including the organisation of a design workshop with architecture students from UPV in July 2014 and consultation in the design phases that followed. The ConBurkina project, funded by the ADSIDEO programme of the Centre for Development Cooperation at UPV is also part of this and represents the formalisation of this collaboration.

6.1. Project objectives

This project aims to offer scientific and technical assessment to the Valencian association and professional training to the local population in order to provide a building alternative that is more comfortable for students and more sustainable to produce and execute than the conventional buildings with formats and technologies imported from Europe which are often constructed as part of international cooperation projects.

This study focuses on the development of an improved solution for the vaults to be built over the schoolrooms, building tile vaults with CEBs (Compressed Earth Blocks) to resolve the bioclimatic needs of the spaces, adapting to materials and resources available locally. The project also tries to bring this constructive technique using CEBs to the residents of Baasneeré. They are expected to assimilate this technique and consider it their own, as an improvement of their traditional adobe. In addition, the assimilation of this technology allows them to improve their constructive technique without renouncing the use of local materials which are perfectly adapted to the local climate, therefore encouraging the sustainability of resources as well as the maintenance and conservation of a local heritage currently under threat from the introduction of new materials.

6.2. Development of the project

The activities carried out as part of this research have focused on three main axes: scientific and technical support in the construction of the school and improving the project in terms of environmental, sociocultural and socioeconomic sustainability; support in the professional training process both for the workers directly involved in the construction of the school and among local young people wanting to learn a trade; and the participation of the population in the construction process of the school through awareness workshops with children and teenagers.

This article was initially based on a study of the current situation in Baasneeré and the existing possibilities in order to ascertain the current needs and the materials and resources which could be accessed to develop a useful and coherent proposal. This information was then used to compile and classify samples of the materials available, testing the production of CEBs and the construction of real-scale tile vaults in order to establish a protocol of action that could be adapted to the conditions of the project (Vegas et al., 2018).

Once the most satisfactory technique was established, training activities were devised to be transmitted to the young people and professionals involved in the project, while a series of participation workshops were set up for local children. Part of the team then travelled to Burkina Faso to hold the workshops planned. These activities included two 20-hour professional training workshops carried out in Ouagadougou with construction professionals and in Baasneeré with local youths and workers, as well as a 5-hour children's workshop (Mileto et al., 2018).

Following this training the initial phase of the project began. Using these results the NGO has already begun a new construction phase which will implement and disseminate the techniques learned.

7. Conclusions

During this project pioneering experiences were carried out in the construction of tile vaults with CEBs and earth mortar. The preliminary results were very positive and it was possible to offer Algemesí Solidari various alternatives for the construction of the school vaults, which were adapted to locally available resources and significantly reduced the wood used in the construction of centring and auxiliary means.

The solution selected was transmitted through workshops to all agents taking part in the work, from architects to workers and local residents, involving them in the project and encouraging the consolidation of the technique beyond the duration of the project. Furthermore, the work carried out opens up a wide range of possibilities for collaboration between the university and NGOs to develop solutions which use traditional architecture to offer environmentally, socioeconomically and socioculturally sustainable construction alternatives in cooperation projects.

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CHAPTER #7.16

CULTURAL HERITAGE: AN OPPORTUNITY TO CONNECT UNIVERSITY AND SOCIETY

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1. Introduction

According to the framework of the specific competences established by Order EDU/2017/2010 for undergraduate students in Foundations of Architecture, included in section 3.1.7 of the Annex, they must understand the relationships between people and buildings and between these and their surroundings. On the other hand, within the Transversal Competences Project of the Universitat Politècnica de València (UPV), its transfer to the social context is also highlighted as a key in academic training. Among the challenges of the Strategic Plan UPV 2015-2020, this university, is positioned as a reference for a quality education oriented to the needs of society and, as a public university, is committed to social responsibility. Therefore, on this base, university-society connectivity must be part of our educational model in all areas of knowledge.

2. Aims

In general terms, to design of practical training activities on the learning-service methodology, evaluated and adjusted to the different levels of commitment and demand, along the course of the academic training of Architecture graduates. In specific terms, it is proposed to apply the previous method to the area of cultural heritage and its related or complementary areas.

3. Background

Even though we position ourselves in the architectural discipline, we can not ignore other artistic references that will help us to allocate ourselves in the teaching-learning process. In this way, the contribution of Dewey (2008) becomes clarifying, when he tells us that instruction in the arts can not be limited to the transmission of information but to communication and participation in life values, since we learn from the action. For this author, the works of art are produced and enjoyed as part of a collective civilization that performs a social function. And also, if we think about the social function of architecture, we must count on the ideas of Aalto (1940) when he tells us: "[...] since architecture covers the entire field of human life, real functional architecture must be functional mainly from the human point of view [...]. Technical functionalism cannot create definite architecture" (p.14).

On the other hand, since the 70's, Muntañola (2016), along with his research team, have gone further in their approaches when they refer to the teaching of architecture and urbanism as the science capable of generating the transformation of our social conception, intergenerational, intercultural and between genders. They even propose to extend their study to the earliest ages at our educational system, in the primary and secondary stages.

But in addition, if we consider a social and critic approach of secondary education, as Jové, Boix, Andrés, Lumbierres and Suau (2007) tell us, secondary schools must be managed as a reflection of society, such as spaces where model actions are cultivated and in the long run move to the citizenship and, because of that, act as a test laboratory to practice social cohesion. Today, the process of maturation and autonomy of high school students is extended during the university stage and, although the colleges are located in a higher level of education, the view of transversal training has gained greater relevance to these educational levels. The traces of this work are proposed and the active transfer of knowledge among the younger generations is incorporated into the process from the belief that education and recognition are a key to guide the new generations in the construction of their identities.

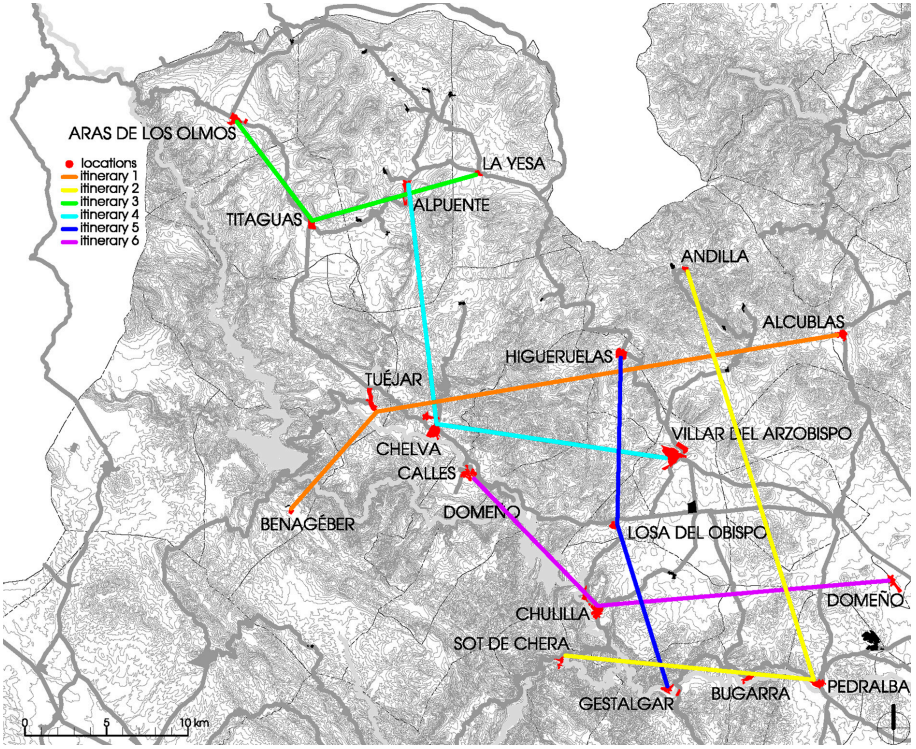

Figure 1. A map of La Serranía with itineraries proposals for dialogue spaces.

4. Actions plan

Our academic and professional training has been developed, within the area of cultural heritage, on the territory of La Serranía region and, because of this, the scale of our proposals refers to small rural communities, also affected by a high degree of dispersion. However, from the uniqueness of each case and the location, these experiences can be standardizing in order to design and reformulate different and diverse activities in other environments and areas of learning. So, after the previous study of the territory, its citizenship and its culture, we move there to feel, hear and dream about its presence. In the present case, short, medium and long-term actions are planned within the one-year program. If we take the territorial and cultural heritage of La Serranía, a region formed by the addition of nineteen local areas, the activities to be carried out, attending to its necessary internal mobility and its external connectivity, would be structured as follows:

4.1. In the short run

• Dialogue spaces open to the general public, led by study groups consisting of three/four students, divided into three sessions, in three/four locations (Figure 1) –Alcublas, Tuéjar, Benagéber; Sot de Chera, Bugarra, Pedralba, Andilla; La Yesa, Titaguas, Aras de los Olmos; Alpuente, Chelva, Villar del Arzobispo; Higueruelas, Losa del Obispo, Gestalgar; and Domeño, Chulilla, Calles–, during an academic year and combined with the surveys, accessible to all the equipment, and made through Google forms, to add to these face-to-face opinions those from the rest of the local citizenship, its visitors, tourists, professionals and other agents

involved or affected:

1st-Session. Getting in touch to capture the knowledge to start working with the citizenship, through the elaboration of a list or graphic map on the main cultural elements of interest and that deserve to be protected according to their opinions.

2nd-Session. Change of impressions to detect how its commitment and attachment to the heritage evolves during the process.

3rd-Session. Conclusions to verify achievement of the objectives established and determine the advantages and disadvantages of the process.

This proposal emerges as an extension of the final paper that I developed in the master's degree for Secondary Education titled "La educación artística y el patrimonio cultural en un ámbito participativo: el IES La Serranía (Valencia)" (Roger, 2017).

• Informative actions on the specific topic of their assets of cultural interest, local relevance and other kinds, aimed at primary school students. Actions will be organized by the same previous work teams, applying the Secondary Education research refered in the previous point to Primary Education (Roger, 2017).

• Itinerant and annual national conferences distributed, in the case of La Serranía, between its three sections of secondary school –Alpuente, Chelva and Villar del Arzobispo–, to bring the participation of recognized experts closer to the place and to announce their situation to the rest of the communities, with the contribution of communications by the architecture students and the rest of disciplines related to the subject of study.

It is proposed to reformulate the experience of the Regional Congress TRADIArq 2015 in a practice exercise among high school students as attendants and university students as speakers.

4.2. In the medium run

• Collaborative workshops, structured by groups of students, to rescue the silenced or forgotten memory of the ethnological spaces –as fields and haystacks in La Yesa; laundries, fountains, troughs, irrigation ponds and walled orchards in Aras de los Olmos; ovens in Corcolilla; wine buckets in Losa del Obispo; mills in Sot de Chera– with a graphic survey of the existing material, taking the narrative discourse of the local actors using recorded voice or video, documented historical research, cataloging proposal, and more photographic report of the current and past state.

After two decades, the action carried out within the Leader II program in the Serrania region is taken as a reference to expand and update the cataloging of its built heritage (Ruiz, Albadalejo, Cebrián y Sanz, 2001).

• Interviews with teachers, public servants, politicians, businessmen, farmers, merchants and artisans, to collect different points of view and different needs regarding the subject of territorial and cultural heritage. Including the audiovisual compilation of the previous material and the production of a documentary to disseminate its content through the respective local government administrations in all municipalities and villages, with the support of the Escuela Politécnica Superior of Gandía, where the Degree in Audiovisual Communication is taught. In this occasion considering teams formed by coordinated students from different university schools.

This idea arises from informative videos such as the one issued by TVE 2 (2015), "Acueducto Peña Cortada", to guarantee its production and supervision with a scientific and historical control verified.

• Register a database, about local professionals, businessmen, jobs and artisans, to build a network of contacts and document the creation of a price model for regional commerce, with the collaboration of the School of Computer and Telecommunications Engineering where experts in these area are taught. Then again, the idea of multidisciplinary work is retaken.

It is proposed to articulate a system similar to the one developed by Red Nacional de Maestros de la Construcción Tradicional (Richard H. Driehaus Charitable Lead Trust, Mileto y Vegas, 2017), but incorporating the scale, casuistry and singularity of the region, in addition to the samples programmed by Instituto Valenciano

de la Edificación whithin the elaboration of its bases of the construction prices (2018).

• Itinerant photographic exhibition, based on the comparative and evolutionary analysis of its urban center, inaugurated in the facilities of the university itself and transferred throughout its nineteen main municipalities to complete the route in the Arxiu General I Fotogràfic de la Diputació de València, with the participation of the Art Faculty and their students in the group work.

The example of the Taller de empleo recuperación paisajes 2013 is taken as a reference in this action, where the results of their work were exposed in the closing act whithin a framework of photographic exhibition based on its current and historical state.

4.3. In the long run

• Design of a territorial plan to connect its network of green infrastructures as a natural heritage of the region.

• Design of an urban-rural plan to integrate the historic spaces of orchards bordering the urban center.

• Conservation and maintenance project along the route of the Roman aqueduct of Peña Cortada that crosses the terms of Tuéjar, Chelva, Calles y Domeño (Roger, 2006).

In these last three activities, the cooperation of the Escuela Politécnica Superior of Gandía is required, where the Degree in Environmental Sciences is taught, and from other Schools of the Valencia Campus: Geodetic, Cartographic and Topographic Engineering, Roads, Channels and Ports, and Agronomic and of the Natural environment.

• Online deposit of documentary evidence of each work carried out, linked to the catalogs of all schools, colleges and public libraries, as well as to the public administrations of local, provincial and autonomous government.

But in addition, all these initiatives are nourished by the evidence obtained through the activities developed from the Vicerrectorado de Participación y Proyección Territorial: Desarrollo rural y ciencia, Aras de los Olmos, 2013; El acueducto romano de Peña Cortada. Propuesta de actuación, Chelva, 2014; Economía Social y cooperativismo, Titaguas, 2016; Ética, valores y ciudadanía, Gestalgar, 2017; Universidad de verano, Aras de los Olmos, 2018.

5. Last considerations

To conclude, the ideas of this article are based on the own essays developed in the level of secondary education in the region and the experiences received from other academic and social fields.

In conclusion, the activities designed:

• open an environment of dialogue between university and society;

• think about university as the space of higher education in which individuals are formed as professionals specialized in different subjects and then converge in everyday life in a common context;

• do not neglect the return to reality that students will face after completing their training.

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CHAPTER #7.17

RE-ARCH OR HOW TO SURVIVE AS A MODERN SCHOOL BUILDING

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1. Introduction

Modern architecture is composed of typologies that were intended to solve the basic and the new needs of the time. Among others, we can find facilities buildings destined for uses such as education, health or industry. These constitute a typology capable of accommodating, actually, new and different uses through the application of concepts, such as re-use, convert, recycle, re-functionalized, re-habilitate... under the idea of re-using the existing structures in the territory. In some cases the use is obsolete, but not the formal validity of the design or the iconic value. Recognizing that its structure, even the more precise is, more uses is capable of accommodating. Two questions highlines, How can we preserve 20th Century Heritage? Should it be different from other periods?

Under these premises research focuses on the study of three school groups built during the 60's in Barcelona. The three schools have been selected for its innovative proposal under the concepts of modern architecture. Nowadays just Betània-Patmos School is registered at Docomomo Registration. All three schools share similarities such as its dates, its private origin, its location in an environment lacking of pre-existing buildings, and an educational program that includes from the kindergarten to high school, three of them surrounded outdoor play areas.
These are projects whose validity remains but in which the pass of the time, and their owners management, have interceded in their actual state. As result we can find different approaches and strategies of transformation:



Figure 1. Betània-patmos School. Source: COAC. Fons Francesc Català Roca (1965). Figure 2. Bell-LLoc School Residence.. Source: Santa & Cole Archive (1965) Figure 3. Aula Escuela Europea. Source:Testa (1975).

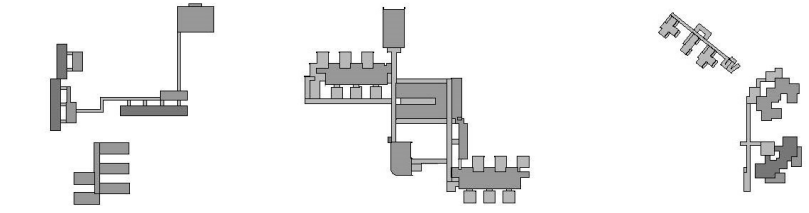
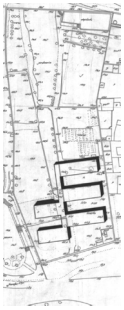


Figure 4. Scketches. Betània-patmos School, Bell-LLoc School Residence, Aula Escuela Europea Source: Redraw. Author (2015).

2. Preservation ans enlargement: Betania-Patmos School

By 1962 the architects Giráldez, López-Íñigo and Subías were commissioned to build a new school complex as a model able to reflect the modernity of the institution and that provide for the coexistence of the two existing schools Betània and Patmos.
Site selection is prompted by the intention of bringing the two schools the consolidated city into a more open space, surrounded by light and nature. On one hand in according to hygienists theories, but also to increase the number of students. The AGES association bought Clos Montserrat state, with an area of 27,501.80 m2, located in the smart neighborhood of Pedralbes. Monastery of Santa Maria de Pedralbes. Finally the set would be completed by 1969 with the construction of the hybrid building that contains the canteen, the kitchen at the first floor and the swimming-pool at the ground floor.
Due to increased needs, the whole complex has experienced several enlargements since the mid-80:

- The first extension is designed by the architects Bartomeus-Casas-Garriga at 1984. The new building had to meet and expand the existing outside sports ground, attached to primary. The intervention, far from subtle and conceptual understanding of the whole establishment, breaks the continuity of existing space in the pavilion of primary silting the gap between the



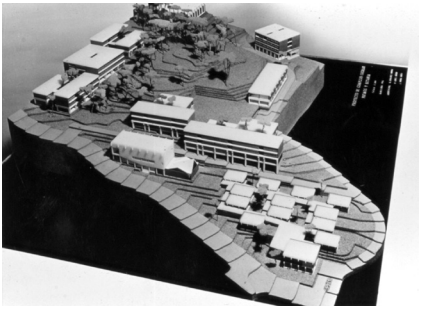


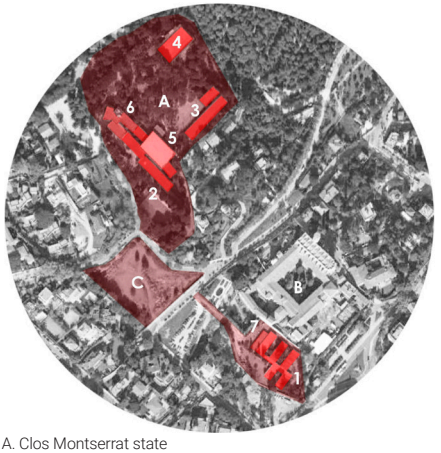
Figure 5. Design plan of the school, first distribution (1963). Figure 6: Design plan of the nursery distribution (1965). Source: Historic Archive Col·legi Oficial d'Arquitectes COAC, Giráldez, López-Íñigo, Subías Collection. Figure 7: Model of the school, first distribution. Source: COAC. Fons Francesc Català Roca (1963).

The programme covered the educational phases of kindergarten, primary and secondary as well as units for administration of each section, a chapel and lecture hall, canteen and kitchen, gymnasium, swimming pool and a hall of residence. The construction was carried out in several stages, and during this process several buildings were elimated out of the programme: the chapel, the lecture hall and the hall of residence.
At the first phase was built the primary school, followed by the construction of the secondary school, returning to the typological model of the first, two classrooms served by a staircase. The nursery, with a new design, will be held in the vegetable gardens of the nearby Royal two pavilions, and therefore reducing the view over the wooded central area.

- About 1998 is carried out an expansion of five new classrooms in the kindergarten building. These are attached to the existing part, located on the north face. The intervention, despite trying to maintain the original character breaks modulation of walls and window openings, which are distributed without apparent order.

- The third extension is carried out about 2002 with the aim of resolving the increasing number of high school students, concentrating in a single building the administrative area of all the school and incorporating a library and a lecture hall. The task falls to the architect Francisco J.

Ferrándiz Gabriel and as a starting point toward the center prompted to set a certain continuity with the primary building, responding to an extension in its longitudinal direction.



A. Clos Montserrat state
B. Royal Monastery Santa Maria de Pedralbes Garden
C. State acquired in 2002, school future enlargement
1. Nursery, 1965
2. Primary school building, 1963. Actually Secondary School
3. Secondary School building,1966. Actually Primary School
4. Dinning hall-gymnasium-swimming pool, 1969
5. Enlargement: sports centre, 1986
6. Enlargement: High school, administration offices, library and lecture hall, 2002
7. Enlargement: Nursery 1996

Figure 8. Actual aerial view: Betania Patmos School. Source: Google Earth edited by Author. (2015).

Betania-Patmos school persists over time and shows the universality and validity of their approaches to modern architecture but also for its adaptability to the changes:

- Is preserved through continuous maintenance performed by the institution, assessing their potential but also their weaknesses. It also adapts to new needs, programme changes and materiality to adapt to new needs.

- Allows enlargements, extending and spreading itself, and is possible thanks to its internal organization, the original set of ordered system that allows, through established guidelines, build new buildings respectful and consistent with the existing. But not all of them have been carried out with respect.

4. Conversion and Enlargement: Bell Lloc School-Residence (1964-1968)

In 1964, the architect, Manuel Baldrich i Tibau receives the order, from the *Caja de Ahorros y Monte Piedad de Barcelona of the Diputació de Barcelona*, to build a summer colony. But finally the design was formalized with the construction of a School-Residence for 1200 students, the residence for 200 people, including teachers and service staff, as the landscape design. The site acquired for the construction is situated in the municipality of la Roca del Vallés, in the Bell-lloc rural property with an area of 122 ha.

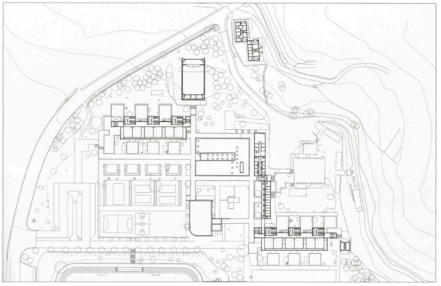


Figure 9. Design plan of the groundfloor school distribution. Source: Plans: Batllé i Roig Arquitectes. (redraw plan 2004).

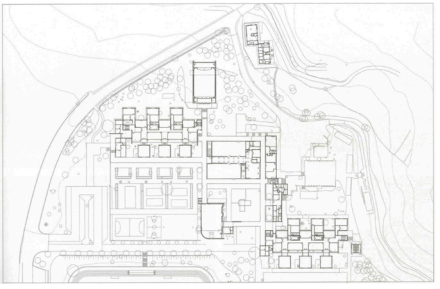


Figure 10. Design plan of the first floor school distribution Source: Plans: Batllé i Roig Arquitectes. (redraw plan 2004).

The conditions established, the environment characteristics and the author's adscription to the values of modern architecture, in its more rationalist line, give as a result a school faithful to the values promulgated by modernity. The

consideration of the location and the program needs are also included in order to resolve aspects such as sustainability.
In 1994 the complex become in disused but keeping its original state. Recently the whole complex has been converted in a business centre in which several companies have settled.
The building starts being a school-residence and, after a period out of use, is adapted and transformed into a business park, Parc de Belloch. This has been mainly due to intrinsic formal values of the primitive school design. The company Santa & Cole has been promoting its transformation and conversion in what it is now, a bet for a new knowledge and design's center. Telefonica Corporate University has settled, and its breadth programme has been resolved under the project of conversion and enlargement of Batllé i Roig arquitectes.
The success of the conversion is due to the confluence of several factors:

- For the good conservation conditions of the original building. Its state had been assured both by the quality of the materials used as for the correct execution that had been carried out. In this sense, despite the logical deterioration due to abandonment and the passage of time, in the intervention has predominated the rescue and restore of the original elements such as the windows, the shelters or the artistic elements.

- For the quality of the original spaces designed, both indoors and outdoors. Aspects such as multi-purpose halls dimensions, optimum resolution and situation of the communication elements, general distribution of the spaces and the optimal proportions of the classrooms. Externally highlights the careful design and zoning of the wide spaces and landscaping and the inclusion of interesting elements as the fountain or the pedestrian paths under the pergolas.

- For the sensitive insertion of new against the old. There is a respectful dialogue with the original building, but in accordance to the present time. This fact is detected in the new blocks builds that do not alter the image of the original one. The materiality, especially outside is rehabilitated but maintaining relevant aspects for the image of the site as the detailing of the windows.

A. Parc de Bell-LLoc state
B. Santa & Cole headquearters
C. Telefonica Coporate University
- Since 2002 Parc de Belloch headquarters:
1. Administrative area.
- Since 2002 , Santa & Cole headquartes:
2. Female building: offices, design studios, exhibitions halls, conference hall, unused areas.
- Since 2009 Telefonica Corporate University.
3. Male building: seminar rooms.
4. Teacher's residence: lounges and offices
5. Canteen and kitchens: reuse
6. Telefonica Corporate University enlargement: main entrance and 180 bedrooms
Unused, original state:
7. Church,
8. Assembly Hall,
9. Staff residence

Figure 11. Actual aerial view: Bell Lloc School Residence. Source: Google Earth edited by Author (2015).

The conversion of the complex as well as its reuse and restoration ensure work under the concepts of sustainability at a time in which resources are increasingly limited and the environment is saturated with existing structures able to accommodate new uses. With all this the school building and its formal laws show a great versatility, offering a place where to work through concepts RE to so persist through change.

5. Preservation and replacement: Aula Escuela Europea School (1968-1974)

In 1968 the architect Guillermo Cosp Vilaró was commissioned to build an experimental school complex, on a plot of 25,800 m2. The design is close to the British model of "comprehensive school", widely spread since the 50's. It takes a

special value to common areas, as spaces not only for a temporal use but also for carrying out different activities.

The program includes kindergarten, primary, secondary and high school and an administration building that was never built. Also incorporated play areas covered under the buildings and numerous sports facilities.

involved on the repairs and the continuous problems that cause initial aspects of the project. Progressively be demolished and rebuild the secondary school building, opened in 2003, the primary building, opened in 2005, and a new sports pavilion has been completed in 2007.

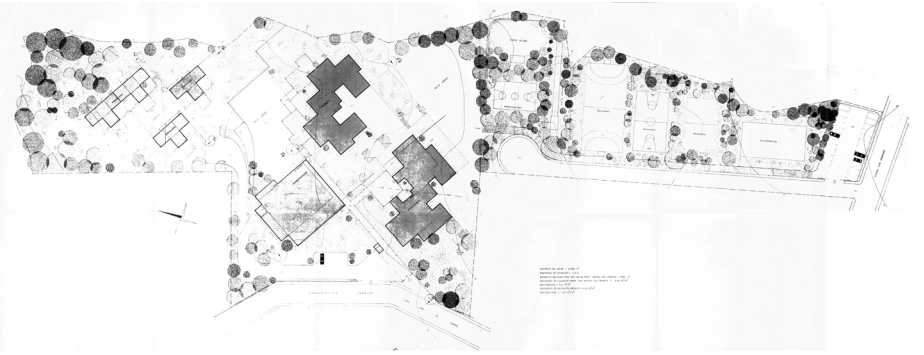


Figure 12. Design plan of the school first distribution (1969). Source: Plans: Contemporary Archive Barcelona (2011).

The larger buildings are built in the wider area of the plot, in line with the existing buildings of the residential area. Both of them are organized, with its peculiarities, from a central space from which gravitate classrooms, seminars and services around this multi-purpose use area.

The kindergarten, of a single-level, is located in the highest part of the land, minimizing the impact on Urban Park area surrounded. It's designed with individual pavilions of three classrooms each one, linked together and abroad. The final configuration was modified according to the 1970 plan. Were inaugurated in 1974, thre years after that the primary school settle in the state.

The construction of the whole school complex was solved with metallic structure and prefabricated slabs. Since its inception was intended that the buildings take into account future changes and transformations.

However, at the beginning of the 21st Century, the Aula foundation decided to demolish the buildings of primary and secondary education. This decision parts of the high economic costs

A. State
1. Kindergarten, 1970-1974: original state
2. New Primary School building, 2005: Built on the ancient site of the elementary school.
3. New Secondary School building, 2003. Built on a new extension area
4. New Gymnasium, 2007: Built on the ancient site othe secondary school.

Figure 13: Final design plan of the nursery distribution (1970). Source: Google Earth edited by Author(2015).

More recently the kindergarten has been refurbished, and the old doors and windows has been replaced by sliding doors, underfloor heating is incorporated and carried out numerous improvements to the covers.
The different volumes in the kindergarten remain indelible memory of the past and to its buildings "brothers" that no longer exist. And here arise the question, Could these buildings have been saved?

6. To RE-ARCH

While it may understand the changing needs of these institutions and their communities, this does not justify the development of interventions that are aimed towards its dismemberment of equity value of the buildings. It should be understood that the loss occurs not only plastic or compositional level, but aims to undermine cultural, historical and symbolic values, which are recorded only with the elapse of time. The development of adequate and comprehensive criteria for the assets to be intervened will undoubtedly lead to optimal design and materials, which would enter into dialogue with the elegant plasticity and successful composition of these emblematic works, recognized or not, of Catalan modernity.
Schools designed under the formal conception of modernity, in which rupture of the global box to articulate with diarthrosis occurs each element (function), are able on one hand to assume interventions to adapt to new needs or changes programmatic and they are even able to abstract from their own definition, to be considered in general terms as a "Modern container", a container whose primary function could succumb but not its order, allowing its reuse to through new uses.
The heritage itself, does not exist, we create it from the interested and intentional look, of

Figures 14-15. New building dialogue with original Betania Patmos School Building. Source: Author (2009).

Figures 16-17. New building dialogue with original Bell-Lloc School Residence. Source: Author (2010).

the expert look. And from it, from the look and recognition of the values of a era is where we can intervene with respect and wisdom, as Habraken said: *"More over, built environment have lives of their own: they grow, renew themselves, and endure for millennia. Conservation may serve to freeze works of art in time, resisting's time effects. But the living environment can persist only through change and adaptation"* Habraken (1998).

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CHAPTER #7.18

FUNCTIONAL OBSOLESCENCE IN MODERN ARCHITECTURE. THE DEMOLITION OF VALENCIA'S GERMAN SCHOOL'S KINDERGARTEN

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1. History and origin

In 1954 the German Federal Republic acquired a site in usufruct from the German School's Association of Valencia (founded in 1909) to build a new building, whose demand for students had been growing since its origins and could no longer accommodate all the descendants of the city's German colony. (V.V.A.A., 2009)
The *Bundesbaudirektion* of Berlin decided to choose the architect Pablo Navarro Alvargonzález as a *Kontakt Architekt* as he was residing in the city and was also a native German speaker. The contract included setting up a studio in the city exclusively intended to carry out the project—which would be supervised by Peter Müller, an architect of the German state *(Bauleiter)* who moved to Valencia together with his wife, who would act as secretary. The technician Rolf-Dieter Weisse also came to Valencia and helped draft the project *(Entwurf / Bearbeitet)*. All together (Valencian and German architects), established the final program after visiting several schools in Germany (specifically in Bonn and Cologne, taking advantage of the contract signing trip), and finally presented a project together with a quotation, which should not be exceeded at any case. Another requirement was that most of the materials used in the project had to come from Germany. This was therefore one of the main reasons for the contributions of innovative construction techniques for modern architecture in Valencia. (Navarro, 2015)
On the other hand, if we focus in the purely local context (already of the late 50's and early 60's) it is worth remembering that the Modern Movement was taking more and more presence in the city, which was also the case of the new urbanism. This was the time when the implementation of exempt buildings instead of closed blocks took a major boost in the surroundings of Jaime Roig Avenue, where the school was located. A street of new urbanization and therefore of new architectural habits (Sentieri, 2013).

2. The Building

2.1. Parameters of the modern movement and complete view of the project

This building is part of the set of projects directed by the *Bundesbaudirektion* abroad and its main interest resides in reflecting a way of seeing architecture that has been now in the Western world for years, and was developed in central Europe towards the 20's. (Navarro 1959)
The first impression when looking at the German School of Valencia is of a clear German influence from the 50s. A country that after the ups and downs of the Second World War, took back a program of renewed national reconstruction. In architectural terms, that would mean going back to the principles of the modern movement which were postulated years ago in the Bauhaus.
The project for the German School was located on a plot of 8,483 square meters and northwest of the city, and 1.5 kilometers away from the city center. The existing Faculty of Medicine and the rest of school universities comprised the educational district of Valencia (Fig. 1).

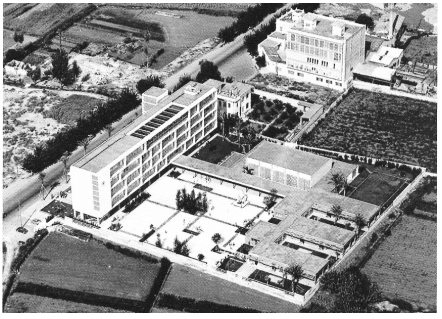

Figure 1. Air view of the set of buildings right after work was finished. Source: VVAA (1961).

On the west side of the plot, the main building (volume A) consisted of: 17 classrooms, a reception, a teachers' room, a director's room, a library, a drawing room, a physics laboratory, the changing rooms, and the toilets. On the north side and connected to the main building by a covered corridor, there was a double height gymnasium (volume B) convertible into an auditorium, with the necessary auxiliary rooms. To the east there was the nursery (volume C), arranged on one floor and structured in five classrooms, a covered playing area, bathrooms and toilets, the director's room, a room for the staff, and a small kitchen. The three volumes perpendicular to each other, housed an open patio to the south (Fig. 2). All the buildings were built with reinforced concrete structure and their facades were open and covered with ceramic tiles or stoneware of Valencia region. (Navarro, 1959)

materials depending on the type of building they belonged to. Volume (A) was mostly covered by small format ceramic materials which were manufactured entirely by a Valencian company called *Mosaico Nolla S.A.*, a company that became extinct. Volume (B) was covered mainly by prefabricated stone and Volume (C), which currently does not exist as it was demolished in 1996 in one of the extensions of the building, was largely coated with exposed brick and other small ceramic tiles (Fig. 2, right side of the image). This latest Volume (C) was known as the "forgotten volume" of the whole — as there are hardly no graphic documents of it — and that's the reason why it was decided to show how it was and what its ending was like.

2.2. Kindergarten

During the research process that the author of this article made about the German School of

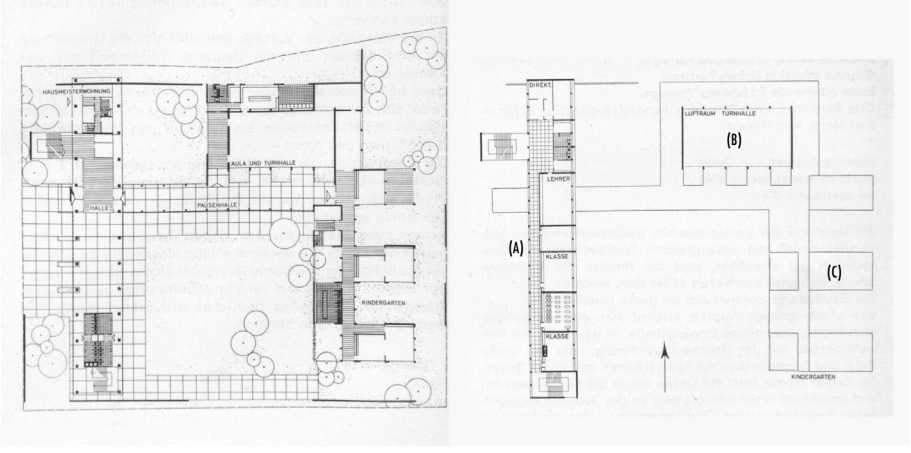

Figure 2. Preliminary draft of the whole German School of Valencia, ground floor and typical floor. Source: Meyer F.S. (1960).

The structure of the German School of Valencia was made entirely of reinforced concrete, a technique that was also quite new in Valencia and that was also executed by the German technicians who were moved to the city to carry out this work in a very rigorous way. The vertical walls, both interior and exterior compartments, were built in hollowed ceramic brick of different thicknesses and covered by ceramic or stone

Valencia, it has been possible to have full access to the original project and to a photographic report where almost all the monthly work visits carried out by Pablo Navarro Alvargonzález were noted down. These graphic documents as well as the information obtained by direct sources (such us the interview with his son Pablo Navarro Esteve) have shed light and have allowed us to notably deepen on the

construction of the building. The building we are focusing the article on is the lower height one of the whole, which is located to the east side of the plot and destined to house the nursery school. In the plans of the original project the elevations and sections together with the most important construction details for the realization of the project are visible. The proportion between the patio and the space destined to be the classrooms was practically the same, so health standards were quite optimal thanks to cross ventilation. (Fig. 3a)
In the interior of the *Kindergarten*, the closing of facade is also visible (Fig. 3b). The classrooms had a folding door (*Harmonikatür*) which gave them more flexibility to give spaces the usage based on the necessities.

Figure 3. View of the patio area and interior of the classrooms. Source: Llado, A. (1996) Navarro, Pablo (1959).

3. Demolition and Functional Obsolescence

Less than twenty years after its construction, it was decided to expand the school to house 300 students more. The *Bundesbaudirektion* created a project entirely in Germany and designated the architect Anna Lladó as *Kontact Architekt* instead of choosing Pablo Navarro again.

3.1. Project for the new Kindergarten and Primary school building

Over the years, the land that belongs to the association was extended to the east and therefore, the original project needed of an intervention to allow a continuity in the plot from the west access. The *Kindergarten* did not have that transversality, and it was entirely replaced by another building of greater surface and volume and connected to the existing footbridge allowing a physical continuity of the whole (Fig. 4).

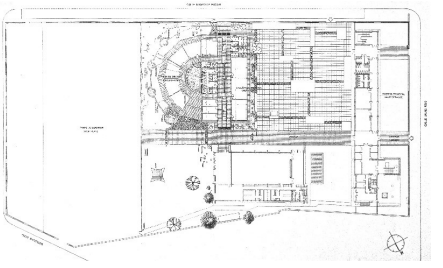

Figure 4. Expansion Project. Source: Llado, A. (1996).

Figure 5. View of the set of buildings. Source: Llado, A. (1996).

However, this continuity does not show a uniform interpretation of its style and breaks away the architectural aesthetics of the whole (Fig. 5). It was not included in the Do. Co. Mo. Mo Registry (Documentation and Conservation of buildings, sites and neighborhoods of the

Modern Movement) until shortly 1997, and therefore this intervention was harshly criticized. Subsequently, and to avoid future possible damages on the rest of the group, the German School of Valencia was provided with Protection Level 2, that means, structural protection level.

4. Conclusions

4.1. Other cases of Functional Obsolescence in Valencia. The demolition of the Nursery of Guadalaviar School

In 1967, less than ten years after the Guadalaviar College in Valencia was built, the school board requested to the same architects who created the original project (Fernando Martínez García-Ordoñez and Jose Mª Dexeus Beatty) the demolition of the building of the Nursery School to raise a new volume of several floors to expand the students' capacity (Palomares, M. T. , 2010) (Fig. 6).

If Pablo Navarro had been requested by the *Bundesbaudirektion* to drive the project of the extension of the German School, probably he would have responded in a similar way: *"We had to abandon the transparency and lightness for the sake of an exhaustive use of the space. We regret having been forced to build "densely"; we believe that children's things should not weigh too much. They deserve being as beautiful and fresh as their laughs and dreams are […]"*

4.2. New functional needs. New demolitions. New projects

In 2016, the Association of the German School of Valencia considered again the possibility of getting more space in terms of height to accommodate more students and held a competition whose winning project proposed once again the demolition of the Nursery and Primary Building, which was built in 1996.

This situation reinforces the fact that the building built in 1996 did not have (and does not have) the sufficient entity and antiquity to be protected, as it did not contribute on anything to the whole, apart from the extra square meters. The new proposal interacts with the original building, but once again it makes us wonder on whether the original Kindergarten building should have been at some point demolished or not (Fig. 7).

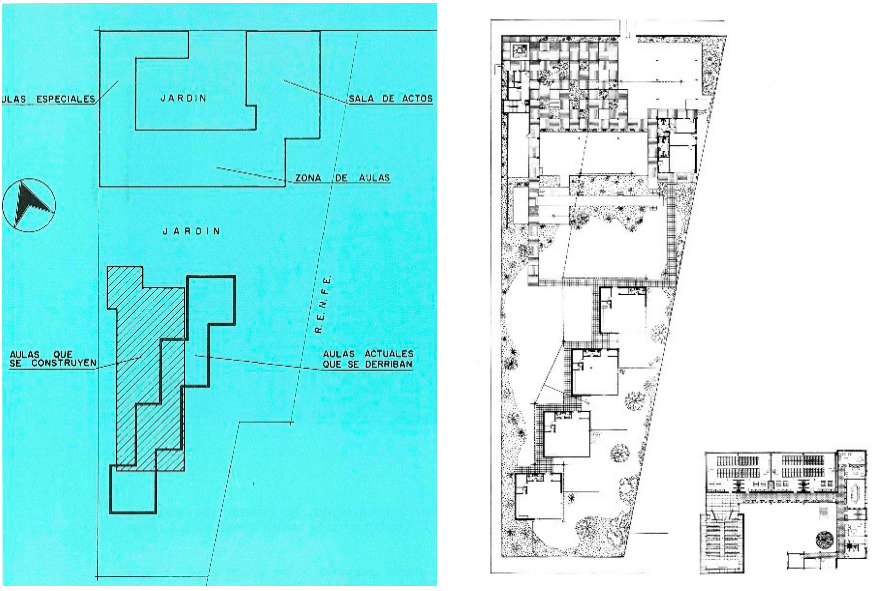

Figure 6. Original state and state to be built of Guadalaviar School. Source: García-Ordoñez, F. M. (1967).

Figure 7. Image of the winning proposal for the expansion, started at 2018. Source: Esteve, I. Moya, N. (2016).

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8

CONCLUSIONS

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Having been honored with the privilege of writing the conclusions of this book, it is unavoidable to begin mentioning the event that served as meeting point of researchers and intensive research laboratory prior to its composition. The Higher Technical School of Architecture of the Polytechnic University of Valencia, one of the oldest Spanish schools of architecture but meaningfully active in any kind of innovation, had envisioned a periodical and international event in order to showcase research in architecture among many other objectives. Mobilizing its own faculty revealed soon as an easy goal when researchers from eighteen different universities, meaning ten different countries and four different continents, expressed their interest in sharing their research works. Such a noticeable interest deserved been honored with a remarkable scientific committee which was easily composed thanks to the incipient interest that the first Valencia International Biennial of Research in Architecture had awaken and to the large number of friendly ties that our school has established after many years of a very active role within the international architectural context. On the 18th and 19th of October, 2018, almost two hundred attendees, meaning faculty, students and practitioners, enjoyed the lectures from internationally renowned speakers such as Thomas Vonier, President of the International Union of Architects; Ole Gustavsen, Snøhetta fellow member and Dean of the Oslo School of Architecture and Design; Ángela García de Paredes, Paredes y Pedrosa fellow member and Professor of the Higher Technical School of Architecture of Madrid; Pepa Cassinello, Director of the Eduardo Torroja Institute and also Professor of the Higher Technical School of Architecture of Madrid; Blanca Lleó, famous architecture researcher and Chair Professor of the Higher Technical School of Architecture of Madrid; and finally Félix Solaguren-Beascoa, famous researcher and Director of the Higher Technical School of Architecture of Barcelona. All of them played a very active role within the event, not only during their keynote lectures, but also interacting with the attending researchers and participating in many fruitful conversations and debates. It is also relevant to mention that the quality of the event was endorsed by the attendance of the deans or deputy deans from countless Spanish and European schools of architecture including Madrid, Barcelona, Valencia, La Coruña, El Vallès, Alicante, Lisbon, Milan, Zurich, Antwerp, Hasselt, Delft, Glasgow, Liechtenstein, Ljubljana, Zagreb and Prague. It is equally important and especially meaningful if we keep in mind our will of drawing attention to research in architecture to mention the attendance and support of the Valencian Regional Chamber of Architects and its three provincial chambers, represented by its Dean and Presidents during those days. Finally, we were blessed by the support of the political institutions, represented by the National General Director of Architecture, Housing and Land of the Spanish Government, the General Secretary of Housing of the Spanish Government, and the Counselor of Housing, Transports and Territorial Structuring of the Valencian Government, who respectively opened and closed the biennial. A meaningful amount of intelligence gathered in Valencia in order to work to the benefit of our entire society during two days that will always be remembered because of the extremely heavy rains that hit the city.

The intrinsic transdisciplinary nature of architecture has made rather difficult to classify the contributions of the different researchers to this book. We, the editors, have considered many options and our final choice, obviously, might be debated but aims to provide the reader a logic and harmonic sequence of relevant issues which are nowadays being worked across the world. Just about half of the contributions have been written by researchers from the Polytechnic University of Valencia, but we would like to highlight the many contributions from other universities and especially the occasional but interesting existence of chapters written by researchers from two different institutions including non-educational ones and purely practitioners.

The first general conclusion to be made is the undoubted interest that research in architecture has awaken in schools of architecture, including all the matters that are taught at schools and consequently all the aspects of the professional practice. Anyhow, it is quite obvious that there are fields with a longer tradition in research meaning that fact it is easier to find contributions akin to their matter.

The second general conclusion, and maybe the most important one, is the indisputably interest that progress in matters of architecture and human habitat has for mankind. Our built environment has a huge influence on our quality of life and on our life expectancy. Therefore it is very important that the schools of architecture must acknowledge their responsibilities in research; that a certain portion of architects, not only academics but also practitioners, focuses on research; and that companies and institutions budget the necessary funds for making research in architecture viable and fruitful.

The third general conclusion would be the double-sided reactive and proactive aspect of research in architecture. The set of chapters of this book, being an inspiring collection of topics under research right now, do not just ambition to provide answers of solutions to already existing questions or demands. Frequently research is posing the questions itself, expanding the boundaries of knowledge and revealing the undoubted proactive side of architecture. This is the reason why the title chosen for this book has been "reactive-proactive architecture". It is a fair tribute to the common research in architecture where the sequence of solutions and new challenges never ends.

A thorough look through the different blocks of chapters provides us with interesting particular conclusions as well. "Research by design in architecture" is one of the topics with most devotees in the nowadays scene. Architectural practice is extremely connected with research since rarely architects reproduce prototypes but create specific built solutions for different complex needs. The awareness of that important fact is setting many researchers in motion. Many are striving for defining the different aspects of research by design, being then able to focus on special issues such as those compiled in this book. Architectural education is one of the few grades which puts students in the position of undertaking a project even at quite early ages. This premature contact with the real practice and its aforementioned relation with research makes important to talk about education and educational models when it comes to talk about research by design. Debates on this specificity of our professional practice which is shared by a short list of other practitioners such as artists or designers, depart from very generic investigations but easily focus on more specific aspects such as projecting criteria, style and aesthetics, and even more specifically in aspects such as the influence of building techniques and new comfort and energy needs on the projecting process.

Ethics, critical thinking and narrative in architecture constitute a field that doesn't have a long tradition in Spain. Most of the Spanish architects developing research on these issues have strong and daily connections with researchers from neighboring fields such as sociologists and philosophers, or with foreign architects. General questions within this matter such as the characteristics and role of the modern city and the importance of correctly interpreting a place prior to any intervention have shared this block of chapters with much more particular approaches focusing on regional issues or controversial aspects of recent architecture. In an upcoming period of time when our daily practice in Western countries is going to be mainly focused on keeping, updating and restoring the buildings that we already have, these issues are called to be extremely important. An increasing number of researches within this field is expected in the next years, since they will provide us the right and indispensable tools for distinguishing and coming to an understanding of what is right and what is wrong, of what should be kept and what should be replaced.

Ideation and representation in architecture has been our shortest block. Despite the existence of perfectly established research journals on this matter such as "EGA" whose headquarters is based in our school, research on these issues is almost strictly developed by academics who teach in the different

departments of architectural graphic expression all over the world. Their works focus on one hand on very general questions such as the influence of computer means in the education of architecture students and the later impact on the daily practice. But on the other hand there is a meaningful professional body of researchers working on specific applications of ideation and representation in architecture not only for analyzing background information but also for depicting architecture and architectural contents in more innovative and adequate ways. In a world were images are so important, a growth of the quantity and quality of researches on these matters is not only expected but also widely desired.

City, territory and landscape constitute a field of knowledge that in architectural education in Spain never detached from the central core of architecture. However the fact that they are studied in specific grades in many foreign countries has provided these matters with a remarkable number of specific associations with a large number of international events and journals. Therefore, it might seem difficult to attract researchers on urbanism to a book with such a generic and transdisciplinary profile. But the awesome amount of researchers on these issues and their natural restless temper has endowed this publication with great contributions on city, territory and landscape. Their works range from the study of urban aspects in ancient times and the importance of archeological landscapes, to the thorough study of the modern city and its evolution. Matters such as urban identity, cohabitation, resiliency and regeneration are taking center stage in societies which, as previously explained, are living in almost completely developed countries with quite a stabilized population in general terms, but which is decidedly moving to the cities. Other classical issues such as mobility, demographic and socioeconomic dynamics, housing prices and urban policies still keep their researchers and eager audience but intelligently adapting their works to a constantly evolving world.

Building technology and advanced materials was a topic bound for success in a publication promoted by a significantly technical school within the frame of the country which endows their architecture students with such a technical background. This is the reason why most of the chapters of this block have been written by local researchers, strangely accompanied by engineers. Anyhow other countries such as Italy, Greece and Cyprus are making intense efforts to keep an updated and interesting research on these issues. At least five different types of research within this field could be distinguished nowadays, being the chapters contained in this book a good example of this. The first type of research deals with building materials, focusing on either classical or sustainable or innovative ones. The second type would be related to innovation in building techniques and production processes. The third set of researches deals with the right conditioning of buildings whose quickly rising standards are constantly challenging researchers in matters of comfort and sustainability. The fourth type of research within the frame of building technology and advanced materials is very connected with the previous one and refers to energy. But the importance that this topic is gaining because of the climate change has endowed this type of researches with their own personality and big interest. Finally, the fifth type of researches in this field deals with structures, their typology, analysis and design. Architectural structures analysis and design capacity is an important and peculiar attribute of architecture practitioners in Spain whose interest is frequently shared by engineers and occasionally by other foreign architects.

Theory and criticism in architecture is one of the oldest fields within research in architecture or at least one of the fields which sooner became aware of what their researchers were doing was expanding the boundaries of knowledge. Classical matters such as the study of relevant examples of the history of architecture are progressively leaving some space to the study of more recent or local cases which are now finding researchers who wish to focus on them. In addition to that, cutting-edge issues such as gender are progressively gaining ground in cultures whose previously mentioned apparent lack of urgencies in matters of rising

new buildings is making their population more sensible and pensive.

Finally, architectural heritage and conservation exhibits a remarkable health when it comes to talk about architectural research. Our school has a long tradition in this field and the amount of authors willing to contribute to this book is the best evidence of it. As abundantly expressed in these conclusions, the current context of architectural practice in developed countries, means a healthy future for this kind of researches and the professional commissions that usually come along. There are many research groups working on ancient buildings and infrastructures, frequently in foreign countries whose economic situation requires international cooperation to keep their heritage safe and restored. The peak that this field of research is experiencing all over the world is making possible that some attention is put in minor local heritage which never had found a chance within a context when few researchers mainly focused on the most famous and endangered architectural works. Finally, it is also important to highlight that the concept of heritage has been enlarged and currently includes all what we have inherited. That fact attributes us the responsibility of discerning which features are synonym of quality and therefore constitute the need of preservation and conservation. And these judgements have to be applied not only to ancient architecture but also to the recent one. Thus, it is more and more frequent to find researchers focusing on the evolution, values and needs of buildings from the Modernism and even more recent periods.

In order to conclude and going back to some ideas expressed in the introduction of this book, the thorough overview that it provides us about the current state of research in architecture reveals that architects are perfectly prepared for a vast range of disciplines which were sadly narrowed during periods when building needs made us focus mainly on designing buildings. It is the task of schools of architecture all over the world to teach their students not only in a comprehensive and thorough manner, but also to dignify all the labor opportunities linked to this diversified and multidisciplinary knowledge. That attitude might avoid mistakes such as the one that architects made when they were absolutely overwhelmed by the amount of commissions for designing new buildings in the 1970s. The leadership in designing the city and taking care of it was abandoned and subsequently taken by other agents who never put the quality of life in the center of their interests. Fifty years later our cities are bearing the consequences of that neglect and this issue is especially worrying in a period when most of the population is moving to the urban areas in the expectation of a better life. The twenty-first century is already being the century of the cities. Architects, now empowered by the awareness of our capacities and responsibilities after the reflection induced by the economic crisis, should step forward and recover our leadership in designing, caring and rethinking our cities. That might be an amazing topic for the next issue of the collection that this book might open.